Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS

Founded 1896

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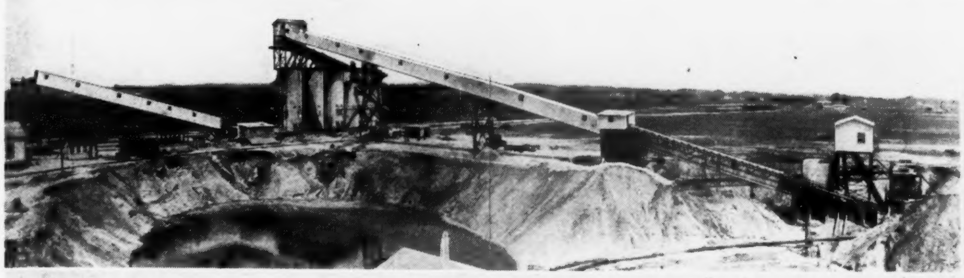

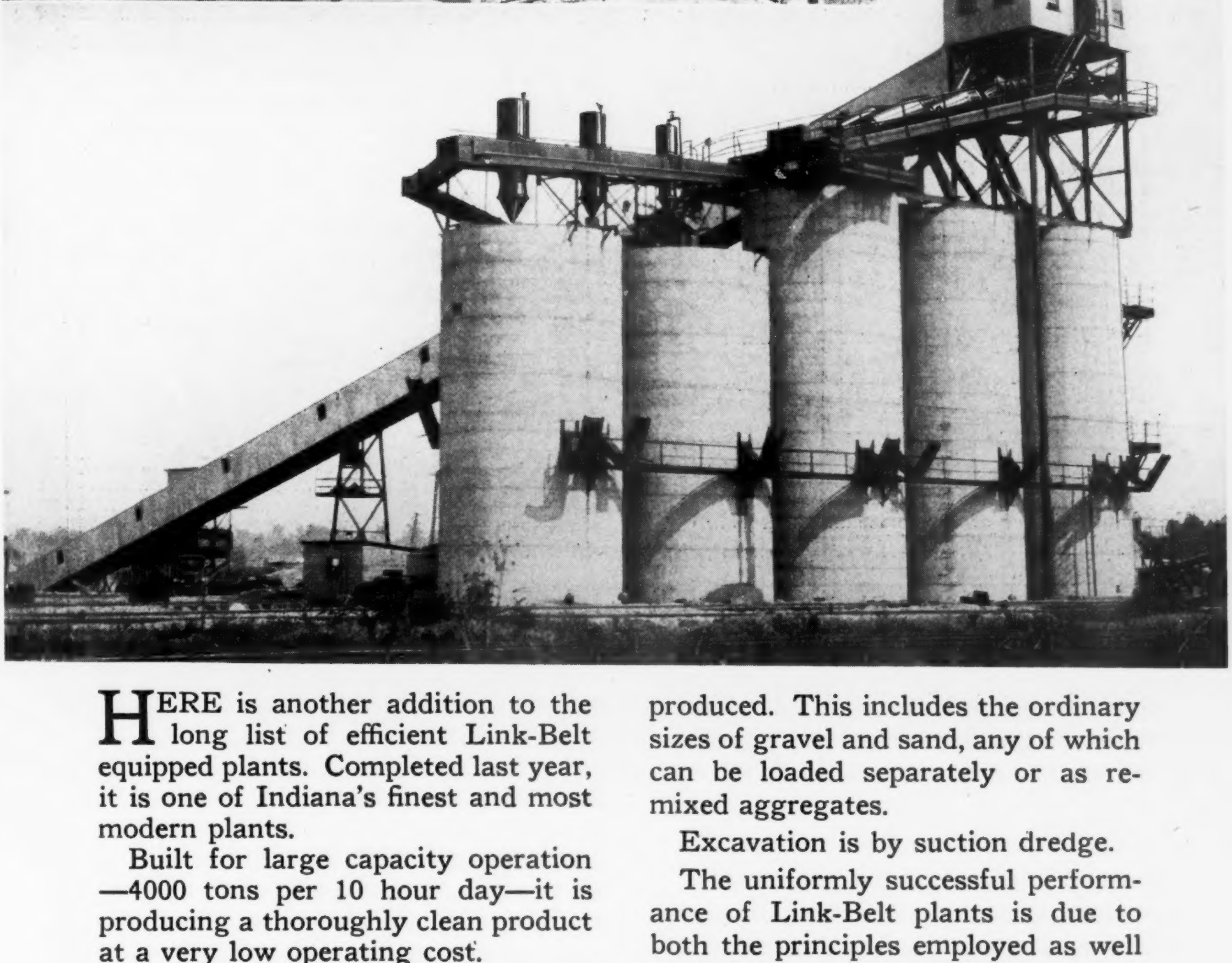

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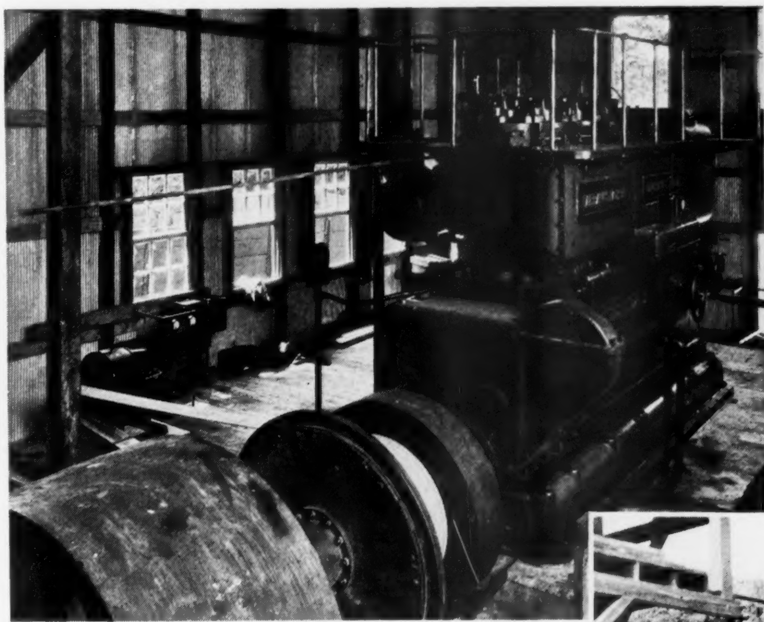
NEW DIESEL-POWERED CRUSHING PLANT IN KENTUCKY

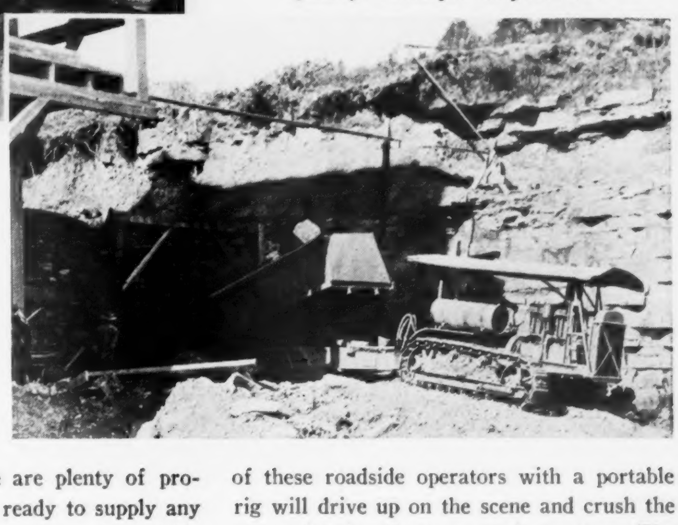
The Sunbeam Quarries Co., Clermont, Ky., Builds Largest Crushing Plant in the State

Sunbeam Quarries Co., Clermont, Ky., an outstanding example of modern Diesel-operated quarry plant



All the units at the plant are driven from this 560-hp. Diesel engine

A tractor and 8-cu. yd. crawler-mounted trailer are used to carry stone from the quarry to the primary crusher



THE STATE of Kentucky is not overly supplied with good roads, with the exception of the arterial highways that connect the larger southern cities with the larger cities in Kentucky, so that some parts of the state are now practically inaccessible to the motorist. It is expected to remedy this condition in 1930. The state is endowed with a host of interesting historical and scenic places to attract the tourist.

Kentucky's north boundry line, the Ohio river, is a prolific source of sand and gravel, so that the aggregate user in the cities located along this navigable stream use sand and gravel to a larger extent, but in those sections in the southern and western parts of the state the crushed-stone producer finds more favorable conditions for operating, for stone is plentiful and competition from sand and gravel is not an important factor. Competition, however, between crushed-stone producers is keen, there are plenty of producers, large and small, ready to supply any new demands and the number of roadside crushing plants is surprisingly large. Even the farmers gather limestone boulders from the surface of their farms and put them in a convenient pile; and at some future time one of these roadside operators with a portable rig will drive up on the scene and crush the accumulated rock at so much per ton. The farmer uses the crushed stone for agricultural purposes for the most part. There was reported to have been a large number of these portable crushing plants operating

The deposit is in the blue limestone, well stratified but quite hard

Cooling ponds and water supply for the Diesel engine and air compressor

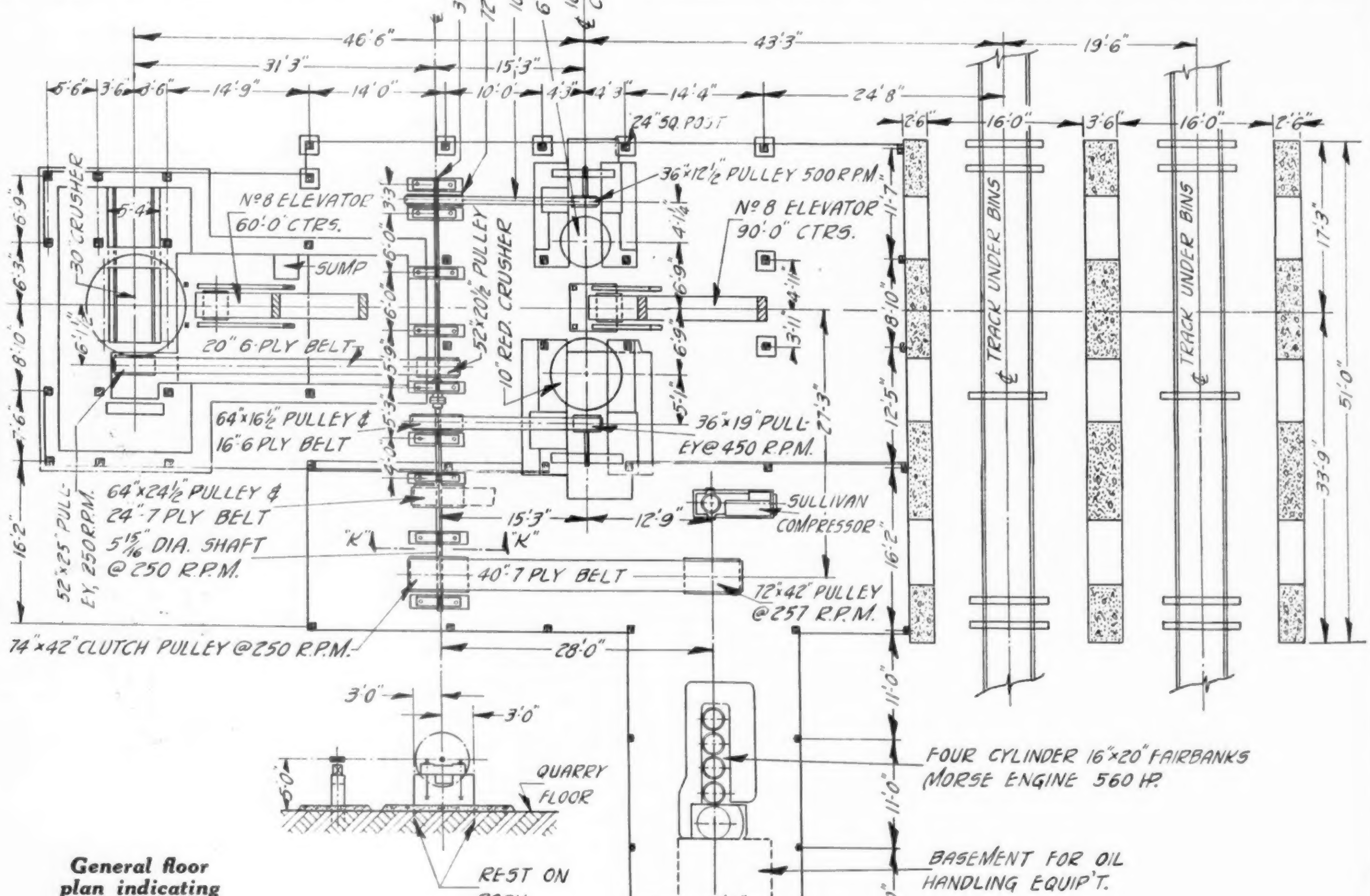
within the state during 1929. As the total volume of building in the past has been comparatively small, the established crushed stone operations are not of large capacity, most of the operations being from 750 to 1000 tons per day.

Early in September, 1929, the Sunbeam Quarries Co. placed its new plant located at Clermont, Ky., in operation. It has a capacity of 1500 tons of crushed stone per day, making it the largest crushed stone operation in the state.

Clermont is a flag stop on the branch line of the Louisville and Nashville railroad that connects Bardstown Junction on the main line of the L. & N. with Springfield, Ky. The plant is about 25 miles south of Louisville, and is not on any paved highway, making the automobile trip to the plant all the more interesting, for one passes through a beautiful section of the state. This section is in reality a forest reserve and game preserve of 13,100 acres created by the Isaac Bernheim Foundation. The reforesting and game-stocking is being sponsored by the Foundation, and within a few years the tract is expected to become one of the show places of Kentucky. At present, however, the remote location of the plant influenced the designers in their choice of equipment.

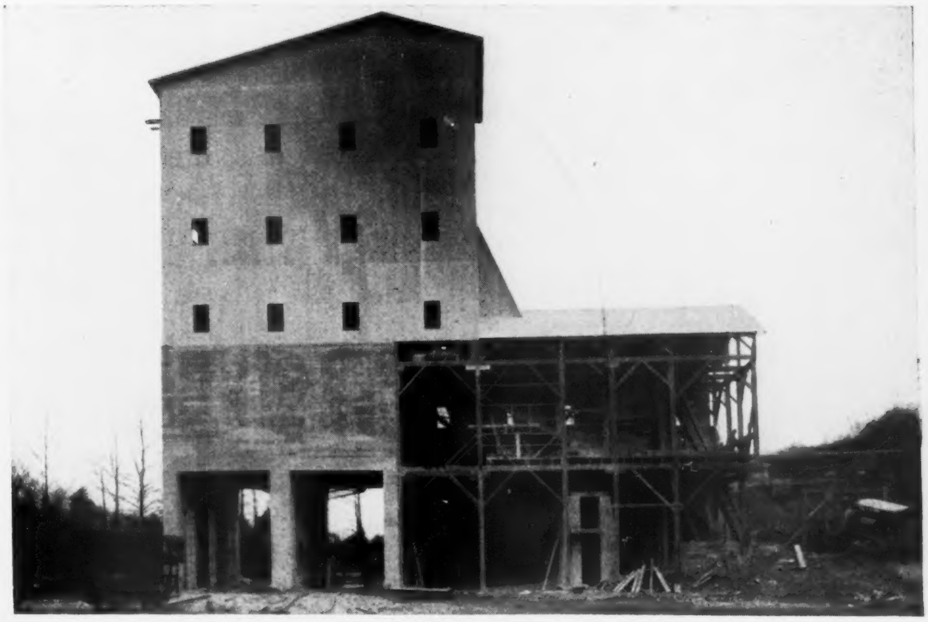
Quarry

The quarry has been opened up for a length of about 2600 ft., starting immediately from a point opposite the primary crusher and extending in a straight line. The height of the face will average about

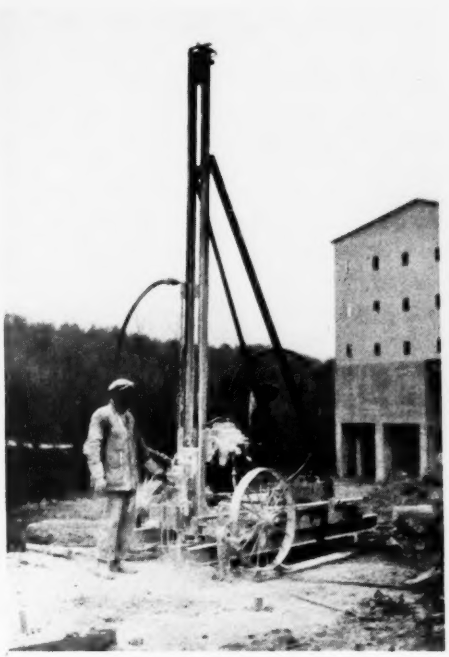


General floor plan indicating locations of principal equipment

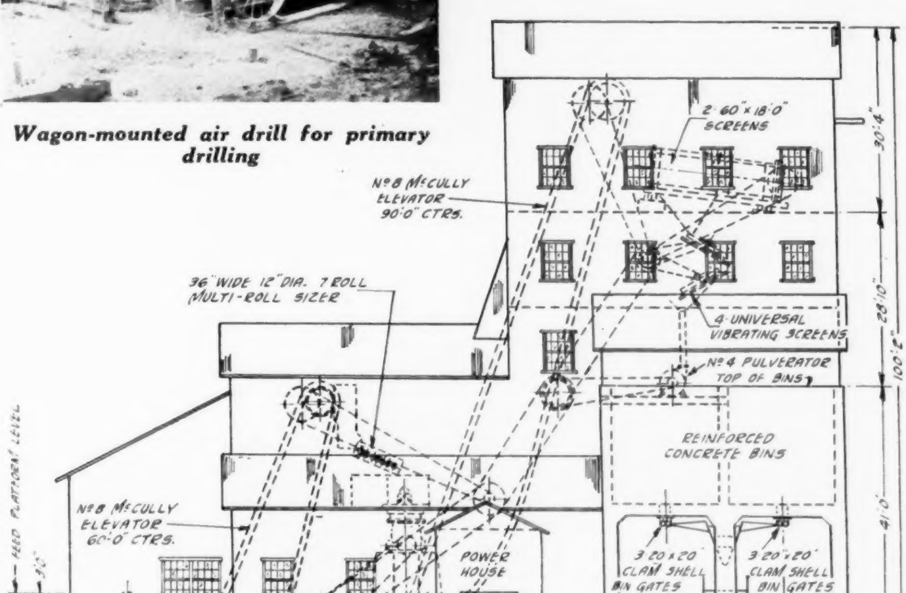
26 ft. and the deposit is covered with about 2 ft. of loose soil overburden. Drilling is done with an Ingersoll-Rand wagon drill, on which is mounted an X-71 air drill. Jackhamers are used for secondary drilling. Holes are drilled at 5-ft. centers and with a 5-ft. burden to a depth slightly below the quarry floor, bottomed at 2-in. diameter, and loaded with 1¾-in. by 18-in. 40% to 60%



The screening and loading plant as seen from the quarry



Wagon-mounted air drill for primary drilling



Rear elevation of the main screening plant

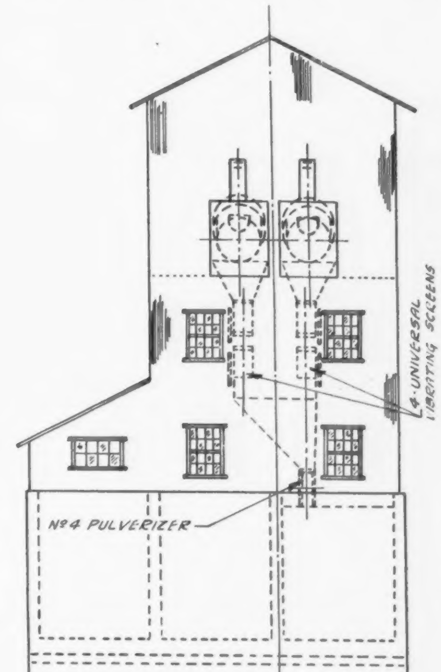
dynamite, exploded with Cordeau-Bickford and electric exploders. Owing to the stratified nature of the rock, the shattering is fair.

For the removal of the overburden the Sunbeam Quarries Co. first purchased a Caterpillar "60" and an 8-yd. Athey, rear-dump, crawler wagon; and as this work advanced faster than expected, the two units were lowered to the quarry floor and used for transportation of stone from the loading shovel to the primary crusher. This haul is now approximately 300 ft. and the single Caterpillar tractor and the Athey trailer handle 500 tons per 10-hour day, making 7 to 8 trips per hour at an average speed of 3.7 miles per hour. Eight tons of stone are handled each trip. The trailer and tractor use 30 gal. of gasoline per day, it was stated. This low fuel consumption is directly traceable to the easy running qualities of the Athey trailer and the Caterpillar tractor.

The adaption of what was originally intended as stripping equipment proved so successful that the operators have decided to purchase additional equipment of the same make and to abandon their original idea of using industrial railway transportation for hauling the stone in the quarry.

Loading of the stone is done by a No. 450 Marion, gas-electric shovel, having a 1¼-yd. dipper.

The limestone is a distinctly stratified



Side elevation of screening plant

material, quite hard and blue in color, and very well suited for economical production of good dimension stone. The management expects to ship considerable of that material later when the difficulties of starting a new plant have been ironed out satisfactorily.

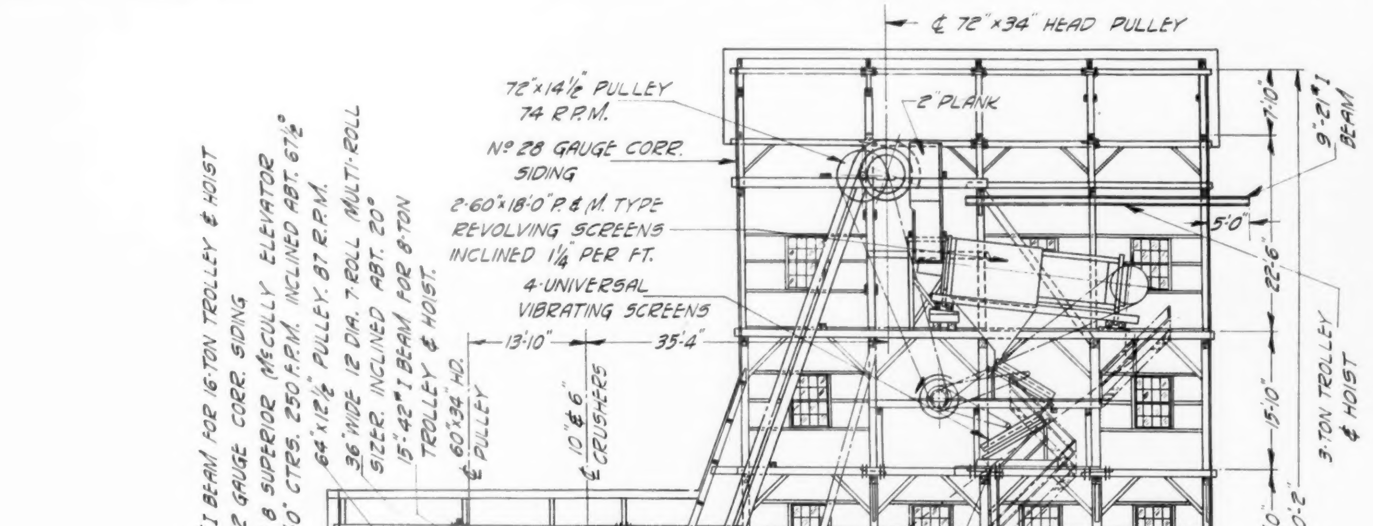
The plant is of reinforced-concrete and wood, enclosed in corrugated iron. The design was by the engineers of the Allis-Chalmers Manufacturing Co., and the plant was erected by the stone company.

The flow of material through the plant is quite simple, the crushed stone from the No. 30 Superior McCully primary crusher falling to a 30-in. bucket elevator serving a set of 36-in., 7-roll, multi-roll sizer or roll grizzly set to 2½-in., the oversize from which falls to a 10-in. gyratory crusher. The fines from the roll grizzly and from the crusher join at the boot of a 30-in. bucket elevator and are elevated approximately 90 ft. to two 18-ft. by 60-in. Allis-Chalmers rotary screens.

The main barrel of the rotary screen has 12 ft. of 1¼-in. round perforations, followed by 6 ft. of 2½-in. round holes. The screens have an 8-ft. dust jacket with ¾-in. round perforations. The oversize from the end of the rotary screens is chuted to a 6-in. gyratory and recrushed, after which the stone rejoins that from the 10-in. gyratory at the boot of the bucket elevator. The fines from the dust jacket fall to four Type C Universal vibrating screens arranged two above two. The top screen has ¼-in. mesh cloth and the bottom ⅛-in. mesh. The two upper Universal screens produce ¼-in. to ¾-in. stone and the bottom vibrators ¼-in. to ⅛-in chips, both of which fall to bins below.

The fines from the lower Universal screens can be chuted to a No. 4 Allis-Chalmers pulverator or hammer mill for reduction to sizes suitable for agricultural limestone. All of the products from the rotary sizing screen and the vibrating screens fall to concrete bins below. There are six bins holding a total of 1200 tons. None of the stone is washed. The two elevators are designated as No. 8 McCullies, have 30-in. buckets riveted to Hewitt Gutta Percha Co. belting, the first elevator having a 60-ft., center to center, lift, and the second a 90-ft. lift.

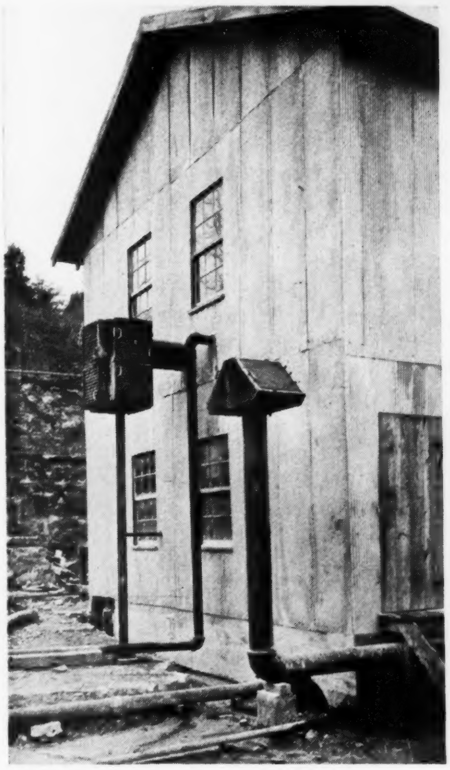
All of the various units in the plant are driven from a series of line- and countershafts, all of which are driven from a single, 4-cylinder, 560-hp., Fairbanks-Morse Diesel engine. The engine chosen was F.-M. Model 33, Style M, and it operates at 257 r.p.m. On the outboard end of the Diesel engine's crankshaft has been placed a Cutler-Hammer magnetic clutch, that carries the entire plant and compressor load. Direct-connected through this main clutch is the main 42-in.



Sectional elevation showing relative position of equipment in entire plant

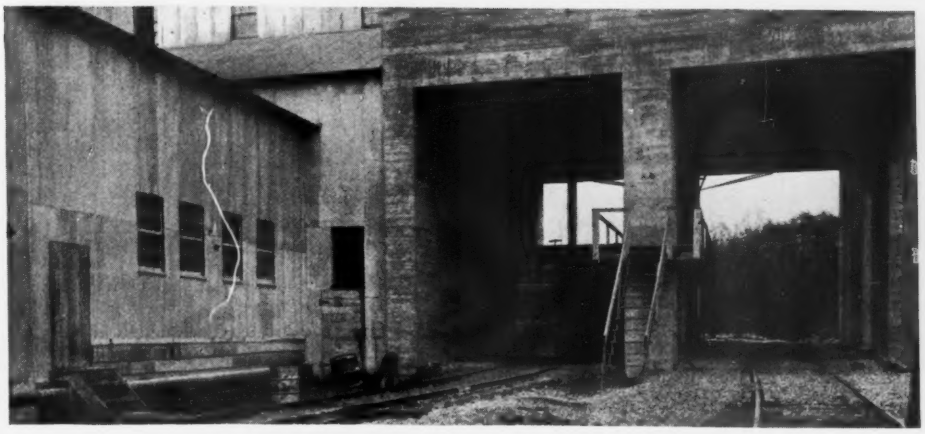
by 72-in. pulley carrying the main drive shaft, followed by another magnetic clutch that operates the 690-cu. ft. per min. angle compound, Sullivan compressor. A third magnetic clutch is on the counter shaft. By this arrangement it is possible to run the plant or compressor independently or jointly, to suit conditions.

The air compressor and the Diesel engine are both supplied with Reed air filters made by the Reed Air Filter Co., Louisville, Ky.



Intake air for Diesel engine and air compressor first passes through filters

At the time the plant was inspected the production was on a winter operating basis and the plant was producing only 500 tons of traffic-bound material per day. This type of material was being produced exclusively and this did not require the use of the roll grizzlies or the vibrating screens. On this basis, the engine was consuming 175 gal. per day of fuel oil, costing 6c. per gal. For a full production of 1500 tons per day, it was said that the increase in oil consumption over that being used would be very small, perhaps totaling 200 gal. per day. It is well to bear in mind also that the engine has a rated capacity of about 100 hp. more than ordinarily would be required to drive the equipment in this plant, but this size of engine was chosen from stock and was the nearest in horsepower rating to the extent estimated requirement. A 25-kw. Fairbanks-Morse generator is belted to the crank shaft of the Diesel engine and supplies the electric current for the magnetic clutches.



Double-track loading facilities at the Sunbeam plant

Cars for loading pass directly under the bins on two tracks and are spotted by a 12-ton Whitcomb gasoline locomotive. Any excess material in the bins can be stockpiled, using this same haulage equipment and any of the eight 10-yd. capacity Western dump cars. The plant and quarry require a total of 20 men.

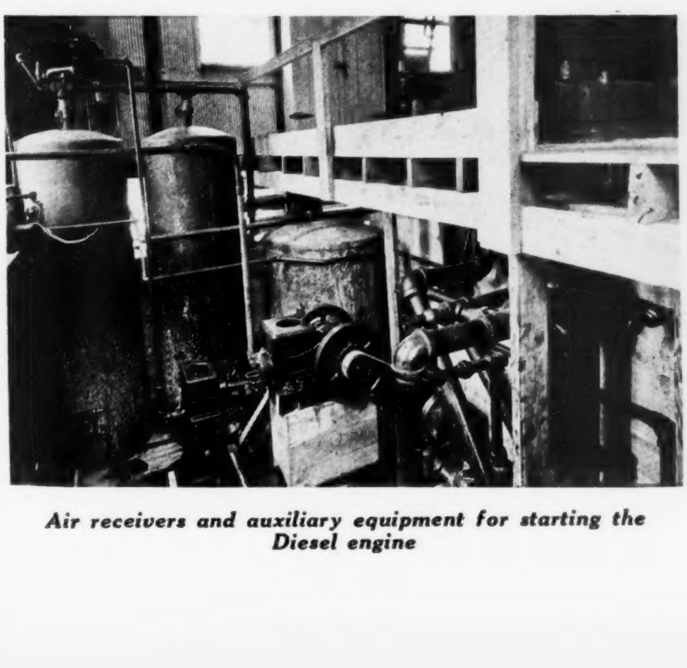
The offices of the Sunbeam Quarries Co. are at the plant. J. B. Beam is president of the company; T. J. Beam, secretary and treasurer, and L. E. Marks, vice-president and general plant superintendent.

Excavating Gravel from Ocean Deposits with a Slackline

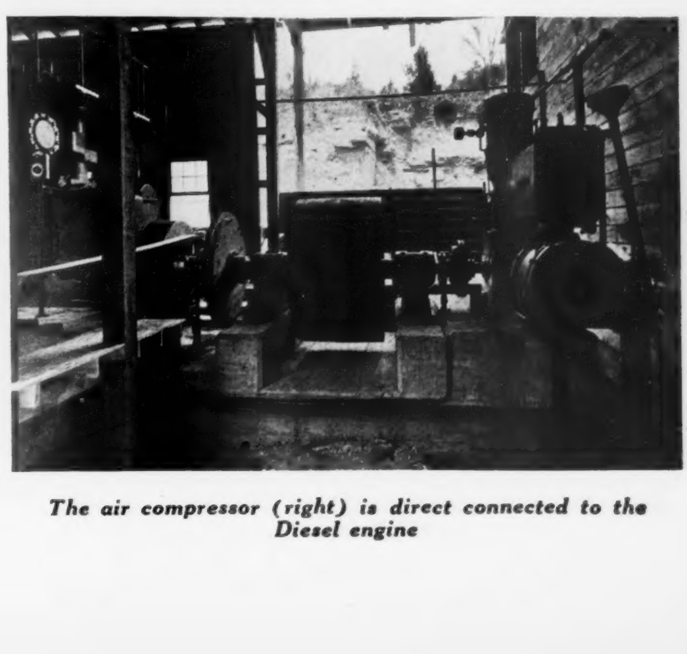
THE use of a slackline cableway excavator to recover material from salt water deposits is rather novel—at least in American practice, where dipper dredges or suction are generally used for the purpose. Yet an English company, Manx Gravel Co., is successfully taking out gravel by such means from the ocean bed. This company's operation is at the northeast coast of the Isle of Man with screening plant on shore.

The slackline excavator is operated by a double-drum hoist driven by a 120 hp. oil engine and has a capacity of 60 tons of gravel per hour. Cableway buckets are discharged to a hopper at the shore tower, which feeds a 300-ton storage bin by means of a Ross chain feeder. Boats are loaded by gravity from the bin.

Owing to the large boulders embedded with the gravel in the ocean stream, the strain on the digging cable is quite severe, and its breaking is not unusual. Operation costs are quite low, the engine using about 7 gal. of fuel oil per 100 tons of gravel recovered. Flood lights are used when digging and loading at night.—*Cement, Lime and Gravel* (England).



Air receivers and auxiliary equipment for starting the Diesel engine



The air compressor (right) is direct connected to the Diesel engine

Modern Natural Cement Plant

Century Cement Corporation, Rosendale, N. Y., Exploiting Century-Old Material Processed by Up-to-Date Methods

THE PLANT of the Century Cement Corp., recently put into operation at Rosendale, near Kingston, N. Y., about 90 miles north of New York City, presents many interesting features. This plant was built for the purpose of making a modern and improved masonry cement for brick and tile work and stucco, using the well-known Rosendale natural cement rock as a base.

Century Cement Corp.'s new plant for manufacture of natural cement, located at Rosendale, N. Y.

It may be of interest, in passing, to note that the cementing qualities of this rock when calcined were discovered accidentally almost a century ago while building a canal through the section. Following the discovery, a considerable industry was built up in the mining of the rock and the calcining of it to make a natural cement.

In the years previous to the present century and the introduction of portland cement, Rosendale natural cement was much used in concrete, and the foundations of the Brooklyn Bridge, the Statue of Liberty in New York Harbor, and other works in which Rosendale natural cement was used, attest its strength and permanence.

Probably one of the reasons for the lessened favor of the old natural cement, was the lack of exact and careful methods of production in its manufacture. And these are among the things that the present manufacturers have aimed to put under control.

In this new operation measures have been taken through careful burning, exact proportioning and fine grinding to maintain the strength and plasticity inherent in the natural cement rock, and by the addition of certain chemicals to control the set and make the product waterproof and non-efflorescent. Through hourly sampling and testing the manufacture of the cement is carefully controlled to hold the quality constant—also the mechanical handling throughout makes for uniformity and ease of control.

The operation consists essentially in calcining the cement rock and then grinding it down to a certain fineness.

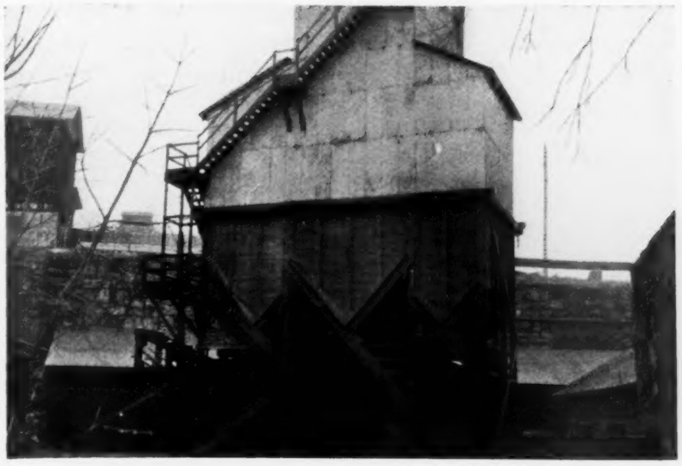
Raw Material

The rock used occurs in two separate veins of somewhat different appearance and composition, the lower vein being 21 ft. thick and of a dark color, while the upper vein is 11 ft. thick and of a lighter color. They are separated by a 15-ft. vein of limestone of somewhat indifferent analyses. All of the rock is obtained by mining, as has been done in the past for many years. The old workings which slope down to lower levels in this particular mine are very interesting, extending for some little distance in both directions. A large quantity of rock has been taken out in years past, and pillars some 30 to 40 ft. apart are all that remain over a considerable area.

The present main entrance into the mine is on the lower 21 ft. vein and is approximately horizontal with a slight slope back

End of one of the underground rooms illustrating the method of quarrying

A view in the mine showing the branch line leading off to the lower room



Bins at the loading end of aerial tramway with the shaft kilns for burning cement in the background

Coal and rock cars are weighed on a track scale at the trestle approach and then dumped to the kilns below

into the mine, the workings on one side being almost level, and on the other side sloping down. The rock structure is thus folded and the entrance runs back on one side or edge of an anticline.

View on the dumping floor over the vertical kilns

At the present time three rooms are being worked, one at the end of the main line, and one on each side of it. These rooms are about 35 to 40 ft. wide, and the farthest workings are about 1000 ft. from the entrance. All that part of the mine which is being used is well lighted, and the ventilation is good, probably due in part to the old workings on the lower slope which run out to several other openings in the bluff.

Drilling is done with jackhammers, air being furnished by a 13½ in. x 8 in. x 10-in., two-stage Chicago Pneumatic air compressor unit located in a compressor house in one of the old rooms near the mine entrance.

A 100-hp., slow-speed Westinghouse synchronous motor, the rotor of which is mounted on the compressor shaft between the low and high pressure sides, drives the compressor, which is equipped with an unloader. The motor has an automatic starting panel and a motor generator set for an exciter.

The rock is loaded by hand into 2-yd. V-type, side-dump, Koppel steel cars with roller bearings, which are hauled by an 8-ton Plymouth gasoline locomotive on 36-in. gage track.

The upper 11-ft. vein of the lighter colored rock is taken out in the same manner and dumped down through a hopper cut out of the rock separating the two veins into Koppel cars, below, in the main 21-ft. workings.

These rock cars are then moved by the Plymouth locomotive to a trestle over the kilns, from which they are dumped into the kilns. Each car is weighed on a track scale at the trestle approach and a record kept. The trestle over the kilns is practically on the same level as the mine floor.

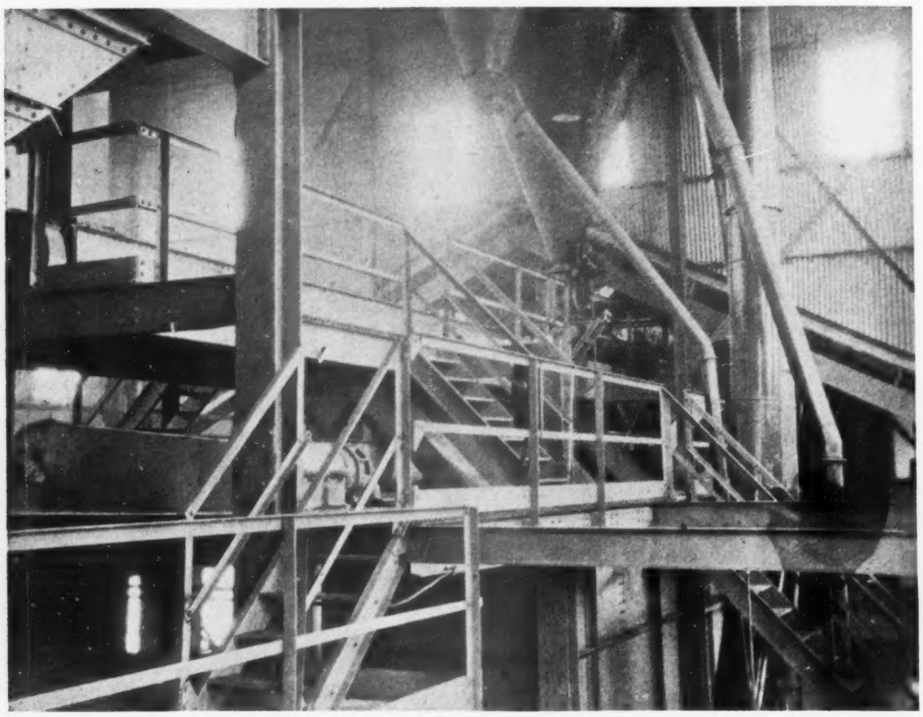
Burning

The calcining is at present done in vertical shaft kilns of the mixed-feed type, using No. 1 buckwheat anthracite coal from the Scranton field. The two kinds of rock are kept separate and are burned in separate kilns. There are 8 kilns.

The coal is spread as uniformly as possible between each car of stone, which is also leveled off, in the proportion of about 6 to 7% by weight of the raw stone. As the loss of weight in burning is about 35%, the ratio of burned material to coal is around 10 to 1, which would indicate a very efficient calcining operation. About 400 lb. of raw material are required per barrel of cement.

It has been found that certain properties of the clinker are indicative of the quality

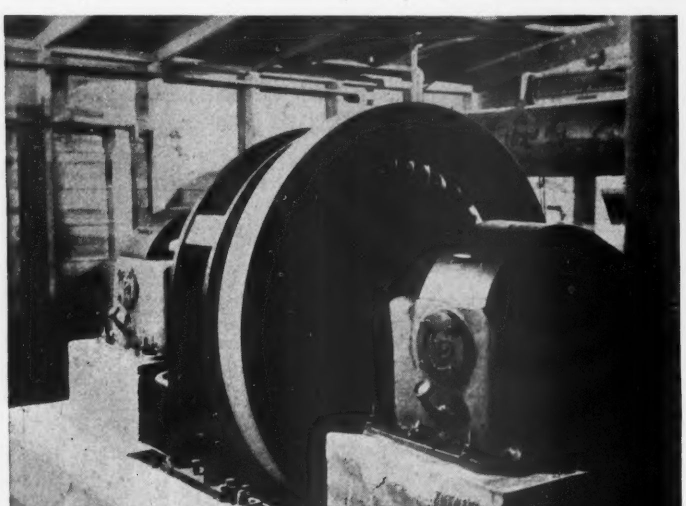
Rock from the upper, lighter vein is chuted to cars in the lower part of the mine



Interior of the finish grinding department

of the finished material and thus by controlling these properties within definite limits, it is possible to insure a product of uniform and excellent quality.

As the calcined rock is drawn from the kilns it is hand-picked to remove any unburned pieces or any slag, and then put through a Sturtevant open-door type crusher, reduced to ¾-in. and finer, and carried up in a 60-ft. bucket elevator to a set of three bins over the loading end of the aerial tramway, transporting the crushed calcined material to the main building for finishing and grinding. Two of the bins are for the two kinds of natural cement rock, dark and light, and the third is for lime at a future date. An 18-in. by 25-ft. Stephens-Adamson apron conveyor feeder runs under the outlets of the bins and discharges to a hopper which loads the cars of the aerial tramway system. The loading is entirely automatic, the conveyor stopping as soon as the hopper contains the tram car load and starting again when it is empty. The hopper empties its load automatically to the tramway car as it passes.



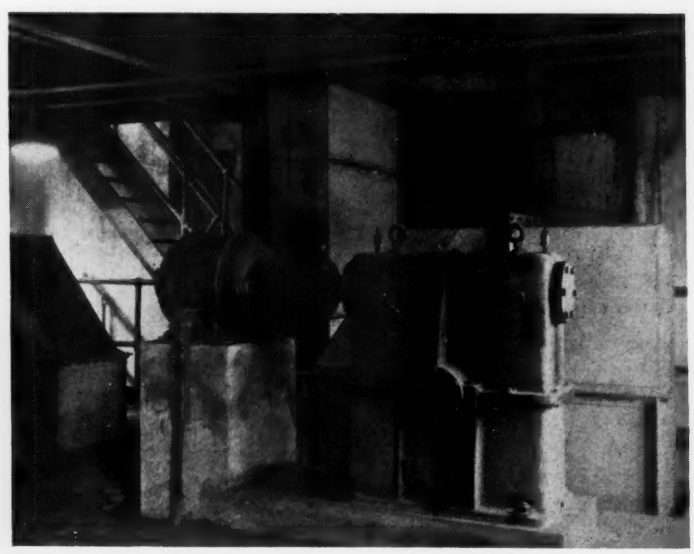
The air compressor for the drills is located in one of the old rooms near the mine entrance

Grinding and Finishing

The transportation from the calcining department to the main building where the grinding and finishing is done is another of the unusual and interesting features. The main mill building is located on the higher ground above the mines and the kilns at a distance of about 2300 ft. and some 230 ft. above the kilns.

To handle the material between these points an automatic aerial tramway furnished by the Interstate Equipment Corp. is used. It is at present equipped with 10 buckets or cars spaced about 460 ft. apart with a capacity of about 90 bbl. per hour, but its capacity may be tripled by increasing the number of buckets. Each bucket carries 9 cu. ft. of material or enough for 2¼ bbl. of cement, and the speed is one bucket every 1½ minutes, or about 310 ft. per minute. The loading and unloading are entirely automatic and the system is driven by a 15-hp. motor. The supporting towers are spaced about 300 ft. apart.

The tramway discharges at the top of the mill to one of three steel bins, from which the materials are fed by two 20-in. and one 30-in. Schaffer Poidometers. Each Poidometer is equipped with a vane in the feed hopper which operates a stop button on the motor control in case the bin becomes empty or arches over. Thus failure of the material in any one hopper will stop all three Poidometers and guard against any wrong mix. After being proportioned by the Poidometers and the additional chemicals added the whole is thoroughly mixed and then elevated and conveyed to a steel bin over the Raymond mill for the first grinding.



Head of one of the elevators showing a typical speed reducer drive

The Raymond system consists of a 5-roll, low-side mill driven through a Texrope drive by a 75-hp. 1200-r.p.m. General Electric motor, a No. 12 fan with 40-hp. 1200-r.p.m. direct connected General Electric motor and a main collector with a small auxiliary collector on the vent of the main collector. The material from the Raymond system is already quite fine, but it is further reduced by grinding in a tube mill. It is spouted and conveyed from the Raymond collector to a steel bin over a 5½x20-ft. F. L. Smidth tube mill driven by a 175-hp. General Electric super-synchronous motor, and is then elevated and conveyed to the

storage silos, or to the packer bin direct. The finished product is of extreme fineness.

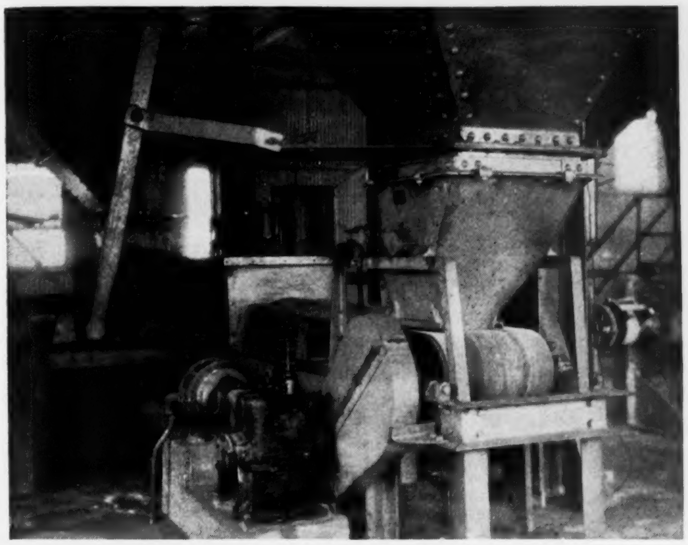
The elevating and conveying arrangements at the finish end are such that the material from the tube mill is elevated and conveyed to a point over the packer bin, where it either goes over a 3-ft. Hum-mer vibrating screen and into the packer bin, or into a 40-ft. elevator, which carries it up to a 36-ft. screw conveyor, over the tops of the silos, from which it is spouted to any of the silos.

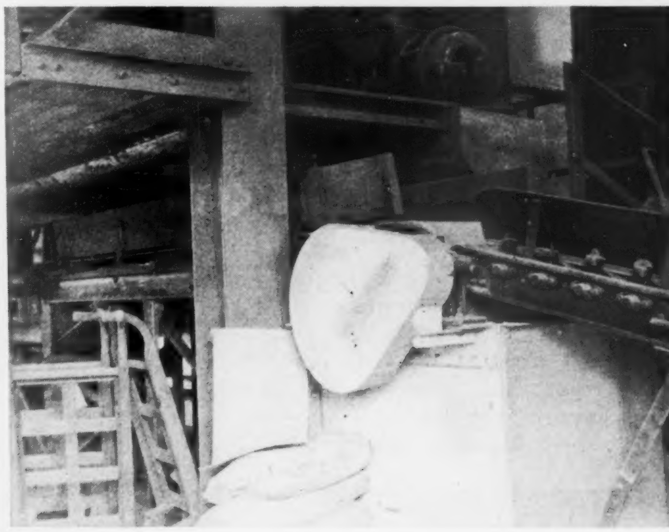
Reclaiming from the bottom of the silos is by either of two parallel 60-ft. screw conveyors to two 60-ft. elevators and over the Hum-mer screen to a packer bin feeding a 4-tube Bates cement packer with a cross-belt conveyor below to the loading floor, as is commonly used in the portland cement industry. The finished cement is packed in paper bags bearing the "Century" brand, containing 1 cu. ft., four bags making a barrel.

The storage silos, of which there are four, were built by the Burrell Engineering and Construction Co. They are each 23½ ft. in diameter by 53 ft. high, from the floor line, with 7-in. reinforced concrete walls, and have an available capacity of about 6000 bbl. each.

The mill was designed for a capacity of 3000 bbl. per day, with 1000 bbl. capacity installed at the present time, and space left and provisions made for making the balance of the installation at any time without interfering with any detail of the operation.

Clinker is proportioned by poidometers and fed to a bin over the roller mill





Underneath the packers showing the conveyor carrying sacked cement to the loading floor

All of the elevating and conveying equipment as now installed is of ample size to take care of the full 3000-bbl. output, so that it is only necessary to add the additional grinding equipment and packer to bring the mill up to its full capacity.

The six elevators are all standardized to 16x8-in. buckets and 24x60-in. steel casings, and the six screw conveyors are all 16-in. This equipment was furnished by Robert L. Latimer and Co. All elevators and conveyors are driven by individual motors through D. O. James geared speed reducers.

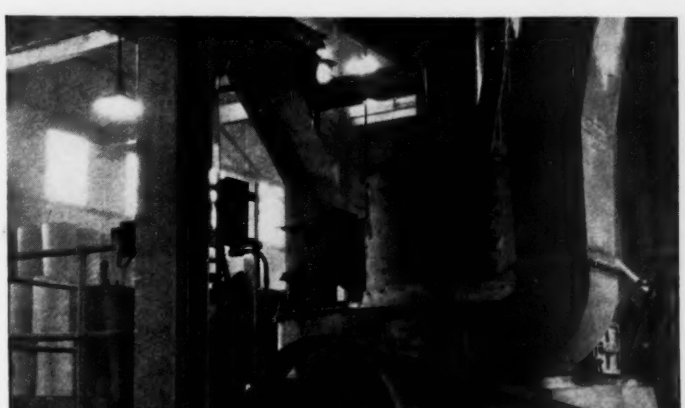
The building, which is 47 ft. wide by 134 ft. long by 70 ft. high, is of substantial steel construction and was fabricated and erected by the Pittsburgh Bridge and Iron Co.

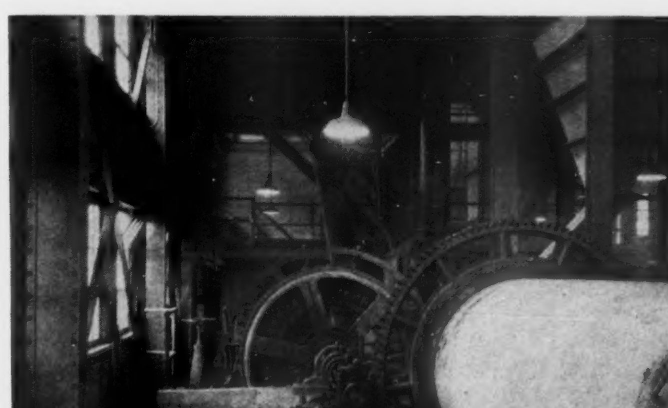
The electric power used in the plant is 3-phase 60-cycle and is brought in at 33,000-volts and transformed down to 2200-volts at an outdoor substation near the mill. It is then further reduced to 440-volts at the mill and at the mine entrance and calcining plant.

General

The whole operation has been carefully planned to assure a uniform high quality of product, and the mechanical and electrical arrangements are such as to not require very many men.

The laboratory is equipped for all necessary physical and chemical testing of the product, and hourly checks are made. Re-





Clinker is first ground in a roller mill (left) and the air-separated product passed to the tube mill (right) for final grinding

One of the 9-cu. ft. aerial tramway buckets carrying clinker from the kilns

search work is also carried on looking to further improvement of the product, and the development of new products. The product now made is really a high early strength masonry cement.

The company owns about 300 acres of property, which includes a deposit of high

Discharging end of tramway at the grinding plant

calcium limestone that will probably be developed later.

The Century Cement Corp. has its main offices at Rosendale, N. Y., with sales offices in New York City, Boston, Cleveland and Philadelphia.

E. Friedman is president; Stewart T. Burton and John B. Morton, vice-presidents; Edgar A. Hahn, secretary; Ernest E. Berger, chief chemist, and George W. Williams, plant superintendent. Soule and Zepp, Baltimore, Md., were consulting engineers on the design and construction of the plant.

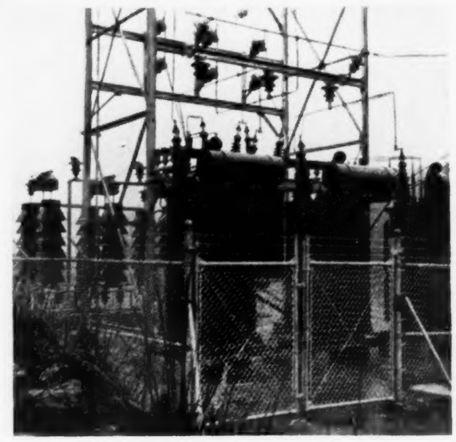
The towers of the aerial tramway are spaced about 460 ft. apart

H. E. Brookby, Chicago, Ill., was consulting engineer on the processing.

In addition to the officers mentioned, John A. Kling is chairman of the board, and among the other stockholders are C. K. Sunshine, Clarence J. Hays, Myron L. Cohen, Morton May, St. Louis; N. L. Danby and Salmon P. Halle of Cleveland, Ohio.

North Carolina Vermiculite Deposits Promise Development

A FEW weeks ago, State Geologist H. J. Bryson of North Carolina made a public announcement of the opportunities for the development of vermiculite, a type of mica which was reported to him as having



Outdoor transformer station, stepping down power from 33,000 v. to 2200 v.

been found in large quantities along Shooting Creek in Clay county.

In the meantime Mr. Bryson has made a personal visit to the deposits and is more impressed than ever with the possibilities for profitable development.

His announcement has brought a number of inquiries regarding the mineral, and several prospective developers have already looked over the field. In addition, he has sent samples to a number of marketing agencies and manufacturers, and several of these have become interested in the mineral.

From early indications, the prospects for development of the deposits of this mineral appear to be encouraging.

Storage silos and mill building, showing at the left the aerial tramway connecting the calcining department with the mill building

General view of the Clarence Sand and Gravel Co.'s deposit and plant at Clarence, N. Y.

New Gravel Plant in the Buffalo District

Simplicity of Operation and Unusual Loading System Feature Clarence Sand and Gravel Co. Operation at Clarence, N. Y.

THE recently completed new plant of the Clarence Sand and Gravel Co. located at Clarence, N. Y., 12 miles east of Buffalo, is one of the more modern sand and gravel plants in the Buffalo district. It replaces the old plant of this company which was located just across the road from the new operation, and has a capacity of about 1500 tons per day. The older operation was described in ROCK PRODUCTS, February 5, 1927.

The truck loading bins were put into operation in July, 1929, and the railroad loading equipment has been in operation since September. The plant is served by the West Shore railroad, and its close-in location gives it a decided advantage on direct trucking into the city.

Grades Produced

Three sizes of washed gravel and three sizes of sand are produced. The gravel is used for road building material and concrete aggregate, and the sand for plaster, mortar, concrete sand and asphalt material. The No. 1, or pea gravel, ¼-in. to ¾-in. size, is used for road material, the top course of concrete roads and for reinforced and other concrete construction. The No. 2 gravel, ¾-in. to 1½-in. size, and the No. 3 gravel, 1½-in. to 2¾-in. size, are used for road material and concrete aggregates.

The coarse sand, or concrete sand, is ¼-in. and under in size with not to exceed 6% passing 100-mesh, and is approved by the New York State Highway Department for state concrete road work. The medium sand is used in plaster and brick mortar, and is of such a size that all passes 8-mesh, or 3/32-in. opening, 75% is retained on 50-mesh, and not over 6% passes 100-mesh. The company specializes on a suitable grade of sand for the gypsum companies of western New York for plaster purposes, so that no screening is required on the job. The fine sand is used for asphalt roads and like requirements. At the present time about 20% of the fines are being lost in the wash water, but measures will be taken soon to conserve these fines.

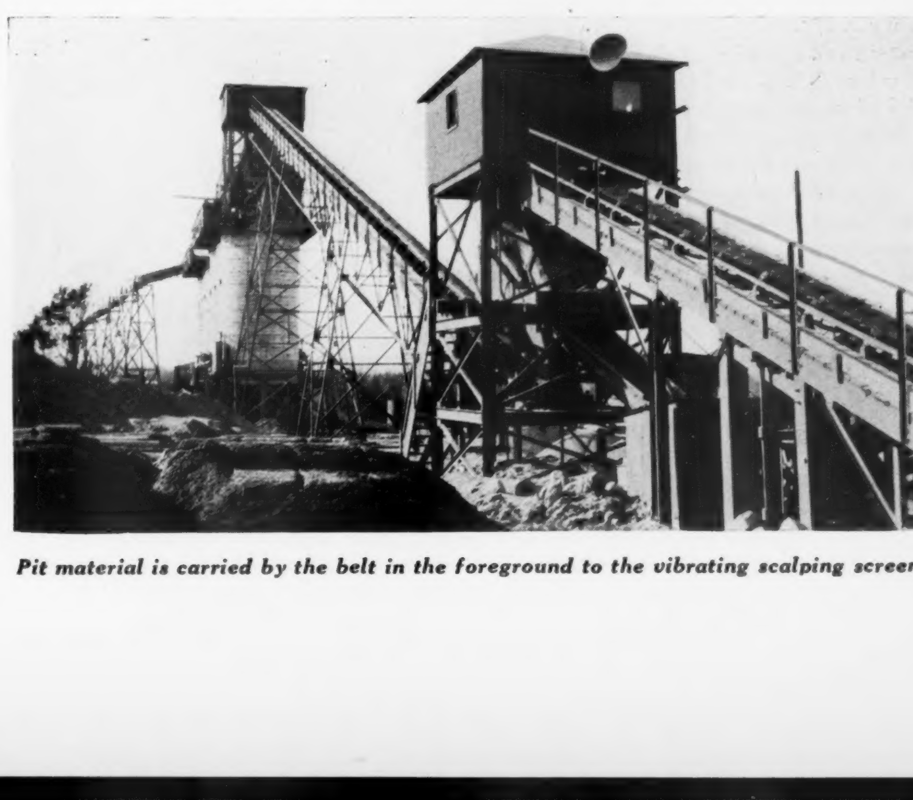
Excavation

The material from the pit is about equally divided as to sand and gravel. The overburden is about 2-ft. thick and is at present cast back. Excavating and loading are done with a Type 0 Thew gasoline, caterpillar-type shovel with ¾-yd. dipper, and a Model 206 gasoline, caterpillar type P. and H. excavator with 1-cu. yd. dipper. For transporting to the track hopper at the plant two 8-ton Plymouth gasoline locomotives are used, with 5-cu. yd. side dump cars, operating on 36-in. gage track.

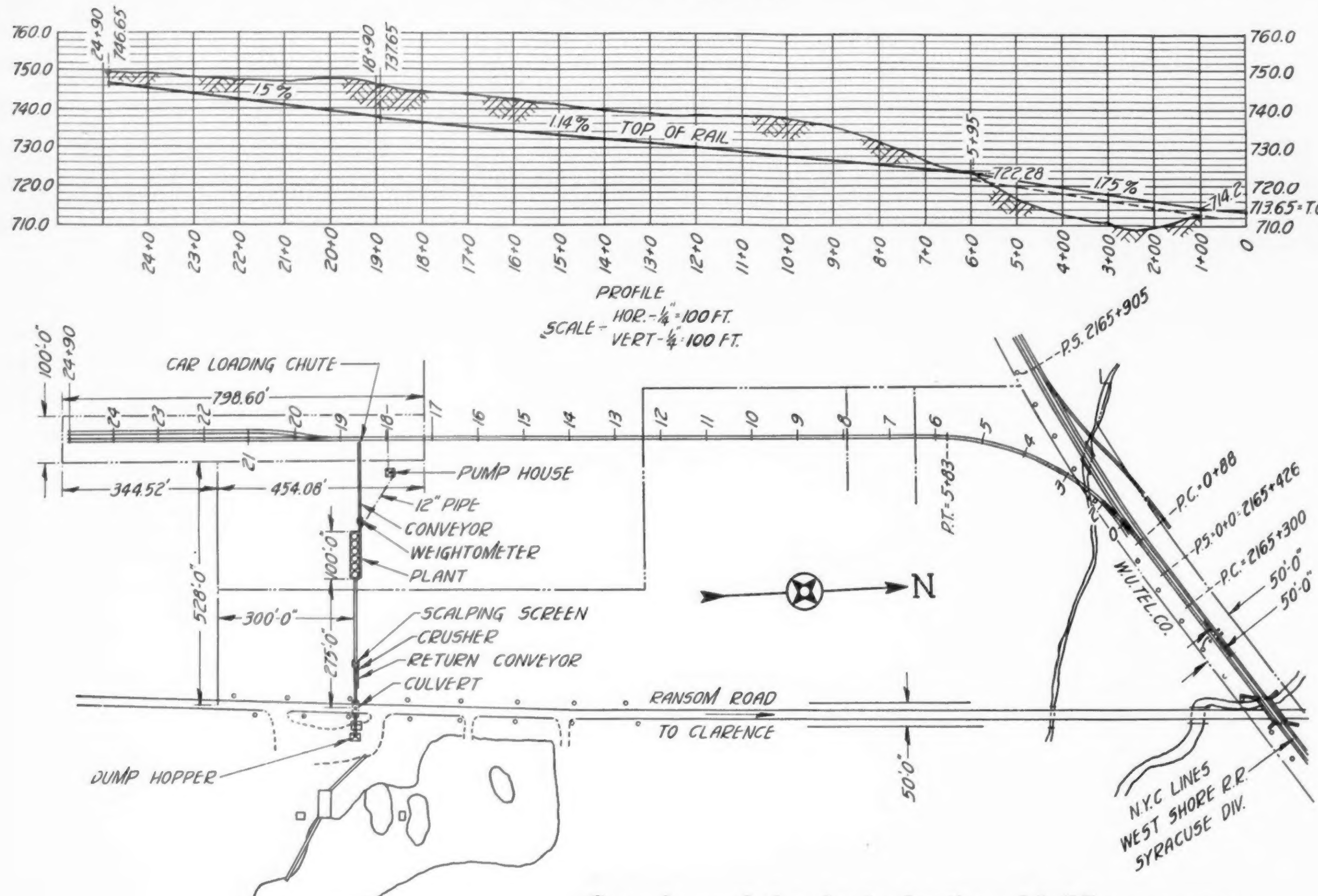
From the cars the material is dumped to a 12x16-ft. track hopper 11 ft. deep. This hopper is of timber construction lined with steel plates, with a bottom opening 2 ft. wide by 5 ft. long, and is self-cleaning. Directly under the opening is a belt conveyor type feeder 36 in. wide by 10 ft. long, of 8-ply heavy rubber covered belt, with closely spaced idlers, and operating at slow speed, which delivers the material on to the main conveyor going to the scalping screen. It is driven by roller chain through a countershaft reduction from the boot shaft of the main conveyor. The top of the track hopper has a bar grizzly to prevent any oversize boulders getting into the hopper.

The track hopper as well as the pit operations are on the opposite side of the highway from the plant, so that the material is carried through a tunnel under the road. The hopper and feeder are located in a concrete pit connecting with a concrete tunnel extending under the highway and containing the lower part of the main conveyor. This main conveyor carrying up to the scalping screen is horizontal under the feeder and hopper, bending up out of the tunnel on a long radius curve to a slope of 18 deg. It is a 30-in. rubber belt conveyor 160 ft. long and is driven by a 35-hp. motor through gears and silent chain.

Scalping is done on a 4x8-ft. Niagara single deck vibrating screen driven by a 3-hp. motor through a Texrope drive and equipped



Pit material is carried by the belt in the foreground to the vibrating scalping screen



General ground plan showing locations of buildings, conveyors and other equipment. The loading track layout in plan and profile are also shown

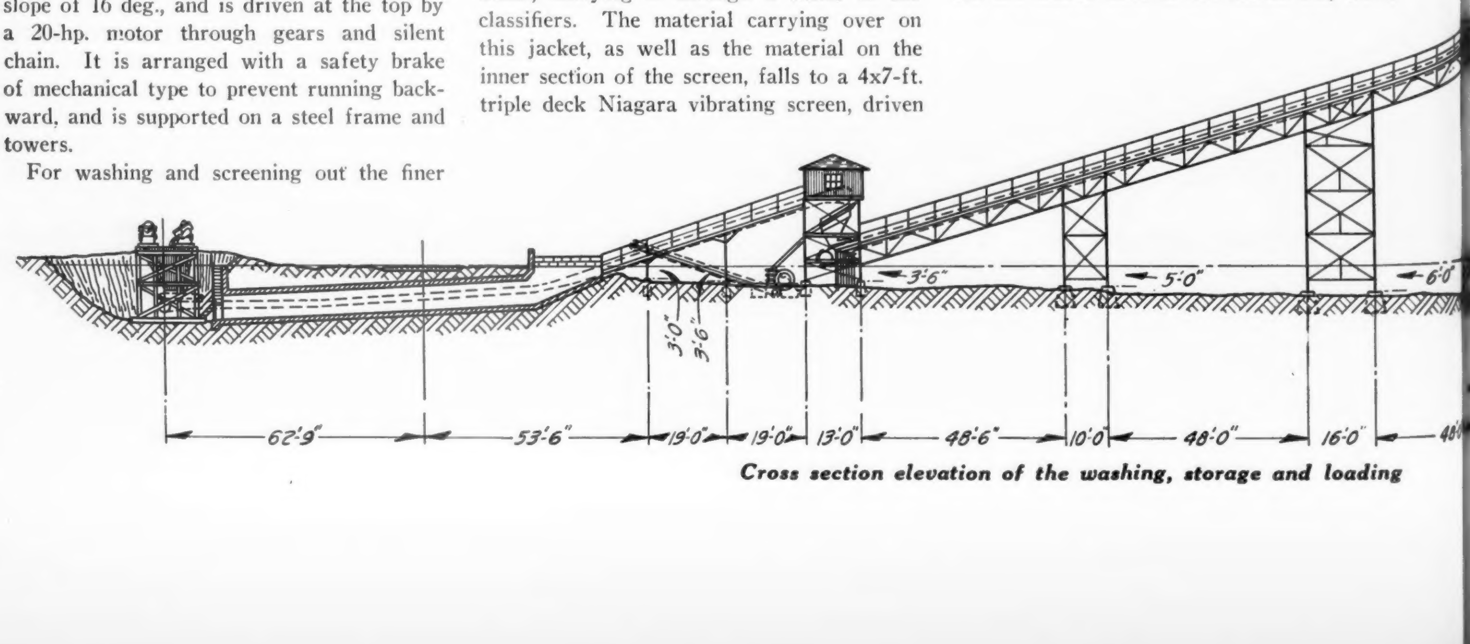
with wire cloth of 2¾-in square opening. The oversize material spouts to a 10x20-in. Good Roads Machinery Co. "Climax" jaw crusher, belt driven from a 20-hp. motor, from which the crushed material is returned to the main conveyor on a short 18-in. belt conveyor driven by a 5-hp. motor. Very little recrushing is necessary, as the material from the pit runs to the smaller sizes.

The crusher is at ground level and the scalping screen is elevated, so that all minus 2¾-in. material passing through the screen is hoppered on to the second section of the main conveyor carrying up to the top of the washing and screening plant. This is a 30-in. rubber belt conveyor 185 ft. long on a slope of 16 deg., and is driven at the top by a 20-hp. motor through gears and silent chain. It is arranged with a safety brake of mechanical type to prevent running backward, and is supported on a steel frame and towers.

For washing and screening out the finer sizes a 5x24-ft. revolving screen is used, driven by a 20-hp. motor through gears and silent chain. A stream of water is used in the feed hopper, and additional jets throughout the length of the screen. The inner section of this washing screen has a 5-ft. blank section at the feed end, then 5 ft. of heavy plate with ½-in. perforations, then 11 ft. of ¾-in. perforations. The first 10 ft. is arranged with retarding rings and with chains, to facilitate scrubbing. The outer jacket extending over most of the screen length is of wire cloth with ¼-in. square openings. Under this jacket is a hopper which catches the minus ¼-in. material and water, carrying it through a flume to the classifiers. The material carrying over on this jacket, as well as the material on the inner section of the screen, falls to a 4x7-ft. triple deck Niagara vibrating screen, driven by a 5-hp. motor through a Texrope drive.

This screen has a 1½-in. square holes on the top deck, ¾-in. square holes on the middle deck and ¼-in. square holes on the botton deck. The 1½-in. to 2¾-in. material passing over the top deck is spouted to the first bin, the ¾- in. to 1½-in. material over the middle deck is spouted to the second bin and the ¼-in. to ¾-in. material over the bottom deck is spouted to the third bin. Any minus ¼-in. material going through the bottom deck joins the material from the revolving screen and passes to the classifiers.

Two 30-in. Shaw classifiers (Link-Belt Co.), and located in the main flume, separate out the coarse sand to the fourth bin, while



Cross section elevation of the washing, storage and loading

Loading cars at the pit

Cars dumping to the track hopper

two other 24-in. Shaw classifiers separate out the medium and the fine sand to the fifth and sixth bins respectively.

Storage

The storage bins are six in number, in one row, and are of the silo type, furnished by the Federal Concrete Co., Buffalo, N. Y., using the Forest S. Hart system. The three gravel bins are 16 ft. dia. by 27 ft. 6 in. high, and the three said bins are 16 ft. dia. by 25 ft. high. They are made up of reinforced concrete staves, 12 in. wide by 2½ in. thick by 2 ft. 6 in. long, the joints in each course being staggered. The edge of the staves are arranged so that they interlock, and each course is banded with a steel rod. They are understood to be a very economical answer to the bin problem.

A structural framework of 12-in. "H" columns and steel floor beams topped with a 7-in. reinforced concrete slab 19 ft. wide by 101 ft. long supports the six bins. The columns are arranged in nine bents of three columns per bent, on 12-ft. 6-in. centers longitudinally, and the outside columns are spaced 16 ft transversely, so that there are eight clear openings for truck loading underneath, each with 11 ft. 6 in. vertical clearance.

All bins have duplex gates on the bottom for truck loading, and the three gravel bins have an additional gate and spout on one side of each bin near the bottom, arranged with a screen in the spout, so that the gravel may be rewashed as it is loaded.

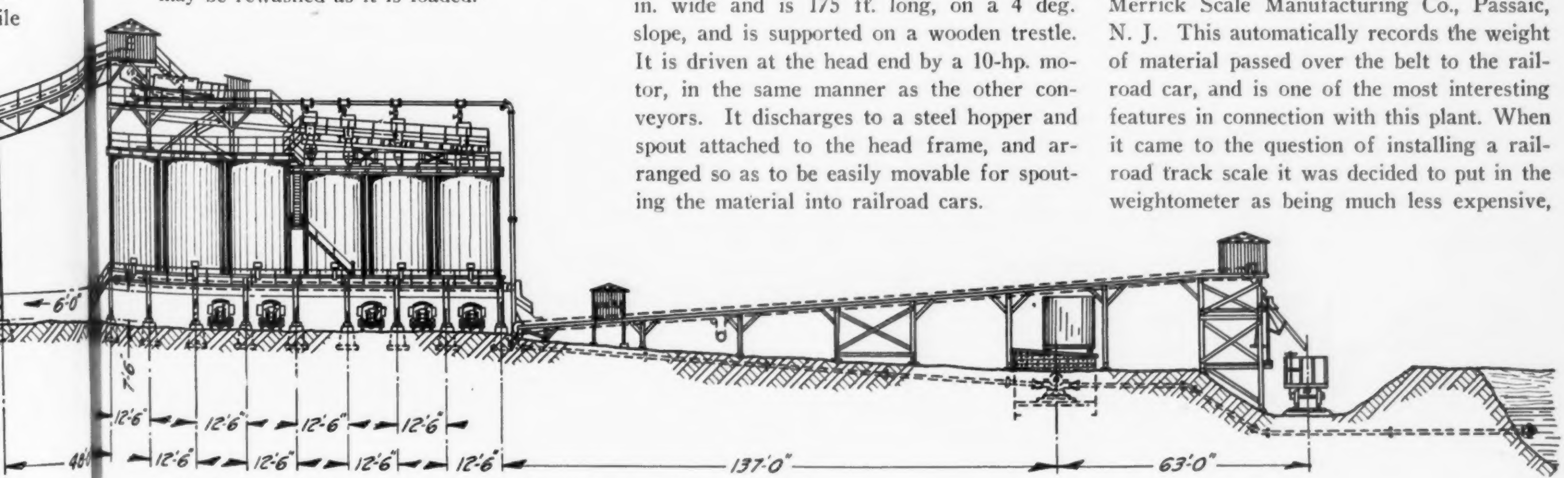
Railroad Loading

For railroad loading, a 24-in. horizontal belt conveyor 100 ft. long is located along the other side of the bins at the level of the bottom of the bins, supported from the structural framework mentioned above and arranged to be fed with material from any of the bins through a gate and spout near the bottom of each bin. This conveyor is driven by roller chain from the boot of a second conveyor below and in line with the first, and leading to the railroad loading point. This second belt conveyor is also 24 in. wide and is 175 ft. long, on a 4 deg. slope, and is supported on a wooden trestle. It is driven at the head end by a 10-hp. motor, in the same manner as the other conveyors. It discharges to a steel hopper and spout attached to the head frame, and arranged so as to be easily movable for spouting the material into railroad cars.

Between the first and second conveyors of this railroad loading equipment, provision is made for re-washing the gravel. The feed end of the second or inclined conveyor is at ground level, and the discharge of the first conveyor is at the level of the bottom of the bins, so that the material drops about 10 ft. on an inclined spout arranged with a screen in such a way that when gravel is being loaded it may be re-washed at this point.

Also near the feed end of the second or inclined conveyor there is installed a Model E "Conveyor Weightometer," made by the Merrick Scale Manufacturing Co., Passaic, N. J. This automatically records the weight of material passed over the belt to the railroad car, and is one of the most interesting features in connection with this plant. When it came to the question of installing a railroad track scale it was decided to put in the weightometer as being much less expensive,

Railroad loading side of storage bins. The bins discharge to the conveyor, which feeds another loading conveyor equipped with an automatic weight recorder



plants of the Clarence Sand and Gravel Co., Clarence, N. Y.

and the best answer to the weighing problem.

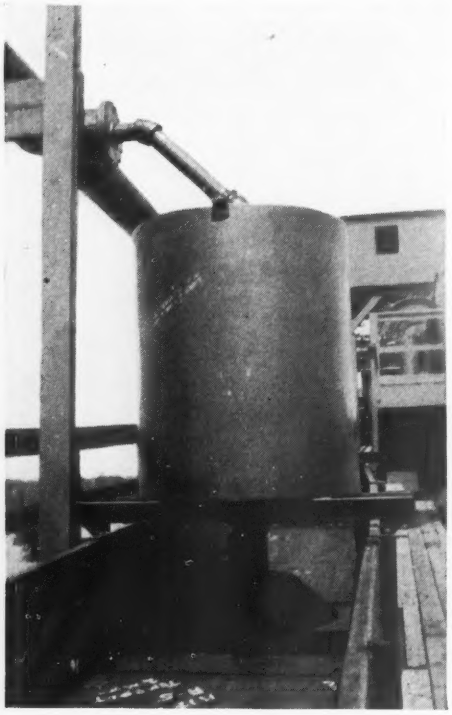
Water Supply

Water for the plant is furnished by a No. 8 Gould single-stage, double suction centrifugal pump, 10-in. suction and 8-in. discharge, delivering 2100 g.p.m. This is direct connected to a 100-hp. 1450-rpm. Burke induction motor. Water is delivered to the washer and screen through about 400-ft. horizontal run and 60-ft. vertical run of Taylor 12-in. spiral riveted pipe.

General

To facilitate railroad shipments, a new siding connecting with the West Shore railroad was put in. This is about 3000 ft. long with 550 ft. of double track opposite the plant, and is of very substantial construction with creosoted oak ties and 105-lb. rails, and thoroughly well ballasted. As already intimated, it is about 200 ft. away from the bins and at right angles to them, leaving the space around the bins entirely clear for truck loading. There is ample room at the bins for trucks to come in on one side, load under any bin, and go out on the other side, without delay or interference.

The plant as seen from the track hopper across the highway. Sand is loaded to trucks from storage by the loader



One of the four sand classifiers in use

The whole plant is of substantial and at the same time economical construction, and arranged in a simple and efficient manner for operation with few men. The pit is operated with six to eight men, and the screening and washing plant with five men, while the whole operation is carried on with from 15 to 17 men, exclusive of truck drivers. The company operates five trucks to take care of part of the hauling.

Electric power is purchased and is transformed down at the plant to 3-phase, 25-cycle, 440-v. There is slightly over 200 hp. of connected motors, most of which are Westinghouse induction motors. The conveyor machinery, as well as the bin gates, were furnished by the Link-Belt Co. and the conveyor belts are Graton and Knight.

Storage piles of the various sizes are maintained, and these are loaded out as required by Barber-Greene loaders, or by a second P. and H. gasoline, caterpillar type excavator with clamshell bucket.

The main offices of the company are at 403 Chamber of Commerce building, Buffalo, N. Y. M. P. Ryley is president and treasurer; Milton R. Lewis is vice-president and superintendent; B. F. Maier is secretary, and Clarence R. Miller is assistant superintendent. Nathan H. Sturdy, Chamber of Commerce building, Buffalo, was consulting engineer on the design and construction of the plant.

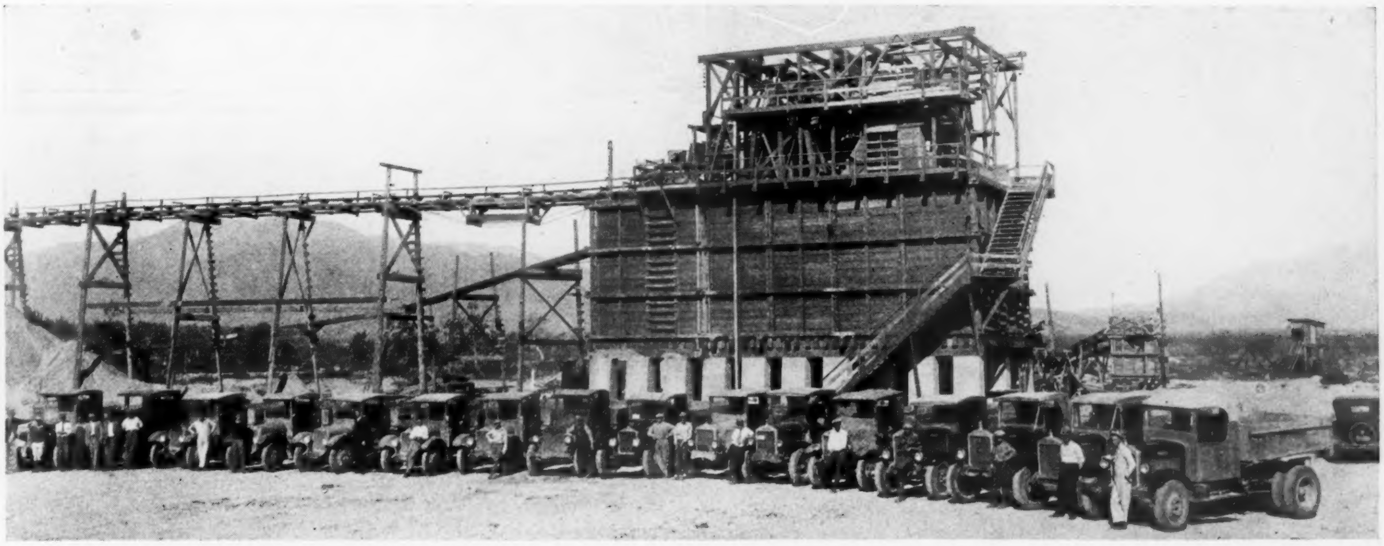
Trucks are loaded from side spouts at the bins

Hard-Surfacing Rock Products Equipment

A NUMBER of interesting applications of "Stoodite," a hard-surfacing metal, are given in a recent issue of *Fusion Facts*, house organ of the Stoody Co., Whittier, Calif. Rock products equipment, such as dredge impellers, bucket teeth, crusher mantles, chutes, etc., can be resurfaced with "Stoodite" either by oxy-acetylene or arc welding with excellent results, the article states. In fact any machinery part which is to be submitted to extreme abrasive action can be hard-surfaced to advantage, it is stated.

Digging Gravel from a Deep Pit

A RECENT issue of the *Sauerman News* contains some interesting details regarding the excavation methods of the Contractors and Builders Supply Co., Peoria, Ill. This company is using a 1½ cu. yd. Sauerman slackline cableway excavator system, roller-bearing equipped and driven by a 2-speed motor electric hoist. When working on a 700-ft. span the bucket makes a cycle from deposit to plant in about 1½ min., the account states. The cableway operates from a 113-ft. mast digging at a depth of about 100 ft. Normal production is given at about 1000 tons per 2-shift day and 1100 tons have been shipped in a 10-hr. day.



New plant of the Triangle Rock and Gravel Co., San Bernardino, Calif., and a part of the company's truck fleet and drivers

The Growth of the Triangle Rock and Gravel Company

The True American Spirit Applied to a Rock Products Operation Has Brought Astonishing Results

By C. J. Brown
(As told by Neal O. Baker)

FROM one little plant with a 150-ton daily capacity in 1922 to a new additional $100,000 plant with a combined capacity of 1400 tons daily in 1929 is the record of the Triangle Rock and Gravel Co. of San Bernardino, Calif. Ideally situated on 115 acres in Lytle Creek wash, the center of the market is but four miles away, and reached by the main highway which passes its door.

This new modern plant is the result of careful estimation and foresight on the part of the owners. Faced with the necessity of completely overhauling the old plant in order to make it adequate to the growing demands of a progressive valley, the company decided to forego patching at a terrific expense and erect another plant of the latest design, equipment and convenience.

When pressed for the reasons how success was made to occur, Neal O. Baker, general manager and part owner, glanced out of the window at a great pile of crushed rock and answered with characteristic honesty and sincerity, "Just hard work." Then after a moment's hesitation he added:

Well-Paid American Labor

"We have no cards up our sleeve at all. From the very beginning we have always had a high-class organization. Our 65 employes are good, all around white, American citizens. Most of them are married and their job means a decent living. We speak just two languages around the plant, the English language and the rock language. We have no foreigners on the pay-roll. The dependable American citizen is always an ace in any business. Then we've been particularly fortunate in having a good steady market up to the recent depression.

Neal O. Baker, general manager of the Triangle plant

Quality and Service

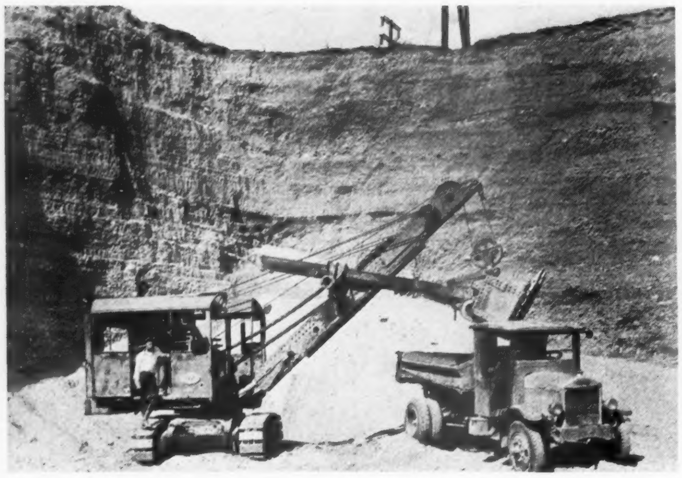
"However, the market doesn't alter our principles. From the very beginning it has been our strict policy to give the customer what he expects and pays for in quality and service. It isn't our policy to try to substitute one class or grade of material for another. In the old plant, when we couldn't fill an order promptly, either because we were short or didn't have it in stock, we would suggest the competitor that we felt would treat the customer as nearly right as we could. We made lots of customers, friends, through that policy.

"Every employe knows just what is expected of him in carrying out our policy. He must be loyal to the firm but serve the customer.

Treat Customers Right

"In handling a contractor we find him just as nice and human as we permit him to be. By treating him right, we've got the edge on a competitor who doesn't make an effort to gain his friendship.

"Of the major contractors, we are today



Loading at the pit

Stockpiling at the new plant

doing business with everyone we started out with. We haven't lost a single one. Our firm is proud of this record. When a new contractor comes into the field we get out and make his acquaintance and show him what we have to offer. The first business we get from him is handled as the last. We don't paint up the first picture and then slowly erase it. We give him the same treatment, quality and service all the time. Every employe knows that it is his business to serve the contractor through the Triangle Rock and Gravel Co."

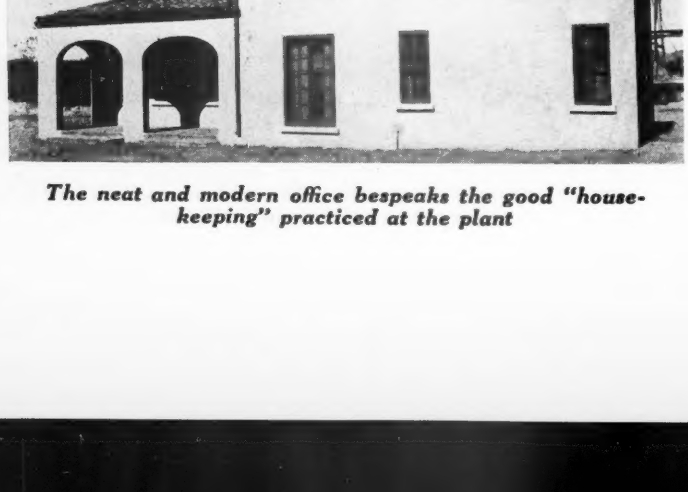
The new plant calls for far less labor than the old plant. Realizing that in these days any business must keep abreast with the times if progression is to be made, the latest and best automatic machinery has been installed. They can now re-run their material and change the grading to meet the demand. In speaking of their equipment, Mr. Baker provided proof of the foresight exercised in selection.

"We went in for over-sizing our equipment," he said in a matter of fact manner. "When engineers advised one thing, we just doubled its strength and guarantee of longer life. Of course the initial cost was greater, but we wanted to get away from mechanical troubles, repair bills, loss of time and overhead. As an example:

Spreading the Equipment

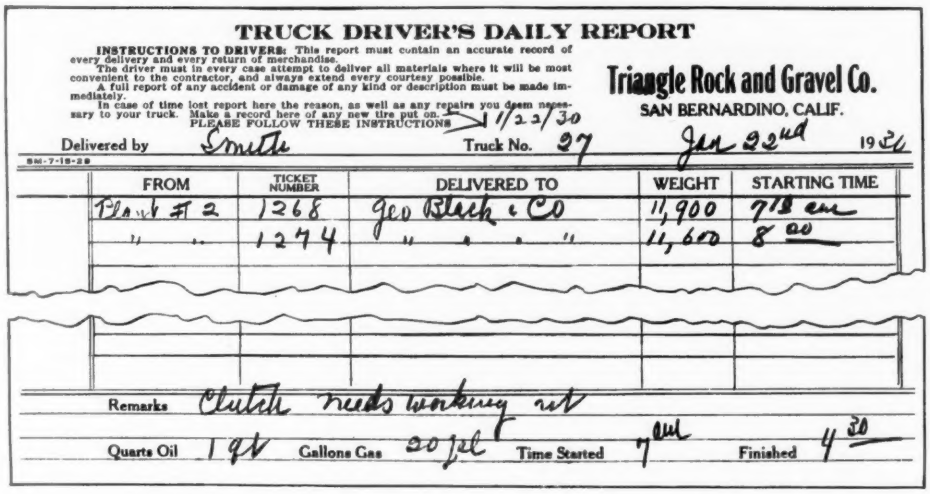
"Our five shovels (Pawling and Harnischfeger Models 204, 600 and 600-A) are combination machines. These machines are equipped with attachments for various classes of work so we rent these shovels to contractors for excavating, road work and wrecking. Right today we have three machines and eight trucks out on the desert excavating for contractors on a 42-mile road job. With these machines are 20 competent men and a foreman.

"This comes pretty near being real service to a contractor and we find that we can make money this way. The excavating end of this in dollars and cents is just as interesting as rocks and sand, and we find that it ties in with this business. All of this would be impossible if it were not for the modern truck which permits us to go farther, cover more area, develop a wider field and take care of overproduction, besides giving us a chance to spread our policy."



The neat and modern office bespeaks the good "housekeeping" practiced at the plant

Speaking of the scale of wages paid, Mr. Baker said: "We pay 15% higher hourly rate than the average truck driver gets in this valley, and to qualify he must meet certain requirements. He must be physically well, under 40, of exceptionally good habits, white and an American citizen, as I stated before. He must have enough technical and mechanical knowledge to keep his truck going on the road. Each driver has his own truck and is held responsible for it. He must know when his machine is in need of repairs and when it goes into the shop he becomes the mechanic's helper. He stays by his truck until it comes out of the shop. When a driver takes his truck out on his first trip he knows that his service belongs to the customer, and as far as the driver is concerned, the customer is right. Anything to the contrary is reported back to the office."



TRUCK DRIVER'S DAILY REPORT

INSTRUCTIONS TO DRIVERS: This report must contain an accurate record of every delivery and every return of merchandise.
The driver must in every case attempt to deliver all materials where it will be most convenient to the contractor, and always extend every courtesy possible.
A full report of any accident or damage of any kind or description must be made immediately.
In case of time lost report here the reason, as well as any repairs you deem necessary to your truck. Make a record here of any new tire put on. 1/22/30
PLEASE FOLLOW THESE INSTRUCTIONS

Triangle Rock and Gravel Co.
SAN BERNARDINO, CALIF.

Delivered by Smith Truck No. 27 Jan 22nd 1930

5M-7-18-28

FROM	TICKET NUMBER	DELIVERED TO	WEIGHT	STARTING TIME
Plant #2	1268	Geo Black & Co	11,900	7 15 am
" "	1274	" " " "	11,600	8 00

Remarks Clutch needs working out

Quarts Oil 1 qt Gallons Gas 20 gal Time Started 7 am Finished 4 30

Facsimile of daily report required of all truck drivers

On the wall of the weighmaster's office, where drivers are hired and fired, there are the following 14 rules which are enforced to the letter:

Drivers' "Commandments"

1. Drivers must make all railroad stops.
2. Drivers must not go by schools at more than 10 miles per hour.
3. Drivers must make all boulevard stops or pay their own fines.

4. Drivers must not carry passengers on trucks.
5. Drivers must make report of all traffic accidents.
6. Drivers must make full report immediately of any accident or damage of any kind or description.
7. Drivers must in every case attempt to deliver all materials where it will be most convenient to the contractor and extend every courtesy possible.
8. Drivers must extend courtesy to the motorist on the road.
9. Drivers must check transmissions and differentials once every two weeks.
10. Drivers must drain crank-case once a week.
11. Drivers must check truck and tighten bolts once a week.
12. Drivers must get purchase order before buying parts for truck.
13. Drivers must get order before going into shop.
14. Drivers must make accurate record of every delivery and every return of merchandise.

Mr. Baker continued:

"We do not hold weekly meetings, but instead each employe is instructed individually. Because of the fact that we believe that it is a benefit to anyone who will devote a part of his spare time to study, this company refunds 100% the total cost of an international correspondence course, when the course has been approved by the company, a diploma received and the student employe is still in the employ of the company.

Helping Men Progress

"From time to time there are men working for us who desire to fit themselves for their chosen work, and we can very well afford to do this. The progress of any organization or individual is measured by their opportunity, their ability and their willingness to keep step with the developments in their own industry, and this gives the man tied down with a family his opportunity to further his chances of advancement by study.

"And another thing before I forget to mention it. We won't stand for a fussy foreman or chips on shoulders or disgruntling. We demand and get courtesy and good spirit among our employes. Our men are glad to see their foreman or general manager. Problems are friendly, constructive discussions. A man isn't fired unless he deserves it. There are times when even one more chance is just that much too much."

Mr. Baker is a comparatively young man in years, but old in rock and gravel experience. Anyone speaking his particular language is assured of a good listener and facts, born out of experience and hard work. With the new plant, he knows that he can figure today what can be done tomorrow. Each department is a dependable cog in a wheel cast of hard work and foresight, tempered by American citizenship. While the new plant far outshines the old plant, the policy of the old has been carried into the new, and its roots are thriving under the master guidance of Mr. Baker.

Feldspar in 1928

EXCESSIVE production capacity and keen competition are reflected in conditions that prevailed at the end of 1928 in the feldspar industry. Although the output of crude feldspar in 1928—210,811 long tons—was the highest on record, the average value per ton dropped for the second successive year. It was $6.73 in 1928, practically the same as the value in 1921, was 31 cents lower than that in 1927 and was 92 cents lower than that in 1926, which is the year of highest average recorded value. The average values of crude feldspar in the United States in 1928, as reported by individual producers, ranged from $3 to $12.31. For New England the range was from $5.13 to $12.31; for Maryland, New York, Pennsylvania and Virginia, from $3 to $9.74; for North Carolina, from $4 to $7.42, and for Arizona, California, Colorado and South Dakota, from $3 to $9.77. The output of crude feldspar in 1928 was 4% greater in quantity than that in 1927 and 0.4% greater than that in 1926. The total value of the crude feldspar sold in 1928 decreased 0.4% compared with 1927 and 12% compared with 1926. The output of ground feldspar was also the highest on record, reaching 227,657 short tons, or 2% more than in 1927 and 1% more than in 1926. The total value of the ground feldspar sold in 1928 decreased 3% compared with 1927 and 8% compared with 1926.

A notable feature of the industry during 1928 was the tendency toward consolidation of companies into groups under single control. The largest of these consolidations, that headed by H. P. Margerum, president of the Golding Sons Co., brings under one control the Golding Sons Co. of Trenton, N. J., the Erwin Feldspar Co., Inc., of Erwin, Tenn., and the Consolidated Feldspar Corp., which, according to report, comprises the following units: The Maine Feldspar Co. of Brunswick, Maine, with a mill at Topsham and one at Auburn, Maine; the Bedford Mining Co., Inc., with mines and mill at Bedford, N. Y.; the Dominion Feldspar Corp. and the New York Feldspar Corp., both of which are at Rochester, N. Y., and the Isco-Bautz Co., Inc., of Murphysboro, Ill. The Consolidated Feldspar Corp. has also purchased the feldspar property in Arizona near Kingman, and has under construction a new mill at Keystone, S. D. Possibly other companies may be included later. The purpose of the consolidation is to form a well-rounded feldspar company having ample supplies of raw materials and adequate milling facilities in the chief feldspar districts.

Another consolidation—the United Feldspar Corp., headed by Charles H. Peddrick, Jr., of New York—includes the Tennessee Mineral Products Co. of Spruce Pine, N. C.; the Oxford Mining and Milling Co. of Portland, Maine, and the United States Feldspar Corp. of Cranberry Creek, N. Y. The Roessler and Hasslacher Chemical Co. of New York will be sole selling agents.

A probable important effect of more centralized control in the industry will be the preparation of a series of well-graded, uniform products, greatly desired by the pottery industries.

For further information the reader is referred to Bureau of Mines publication, "Feldspar in 1928," from which the above is taken.

Strip Mining Progress

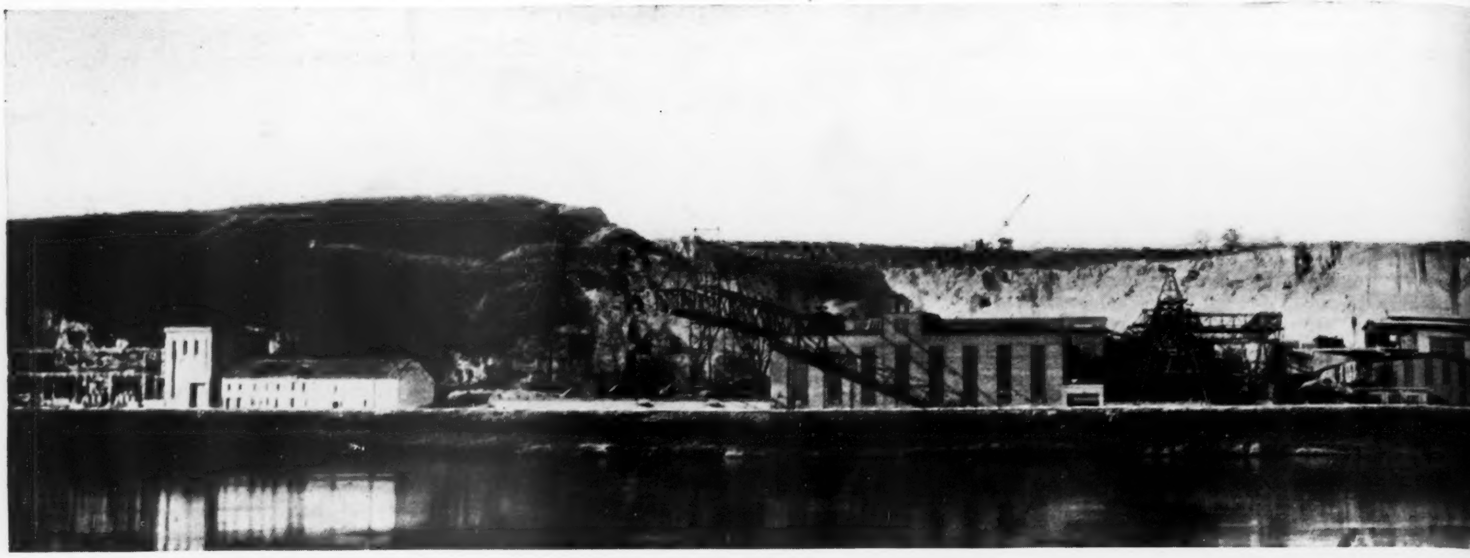
THE growing importance of strip mining was featured at the recent annual meeting of the Illinois Society of Engineers held in East St. Louis, Ill., when the mining, mechanical and electrical section devoted a special session to this subject. Developments in the design, construction and use of stripping shovels were outlined in a paper entitled "Mechanical Appliances Used in Strip Mining," by D. J. Shelton, vice-president, Marion Steam Shovel Co. This paper traced the development from the front-end combination of a 90-ft. boom with a 60-ft. dipper handle and an 8-cu. yd. dipper stripping coal economically from areas with a cover of 40 to 50 ft. to the 15-cu. yd. shovels designed to carry a 20-cu. yd. dipper on a 100-ft. boom to handle 65 to 70 ft. of overburden. A complementary development are the larger draglines with capacities of 6- to 10-cu. yd. per dipperful on booms as great as 200 ft. in length.

An innovation in haulage equipment is constituted in the satisfactory substitution of automotive trucks for rail haulage by four or five stripping companies in the Kansas field, one installation comprising six-wheel trucks with capacities up to 10 tons. Don B. McCloud of Du Quoin, Ill., read a paper on "Modern Explosives in Strip Mining." Such overburden is now being stripped at a number of large operations, he said. The development of better blasting methods has pushed aside hard strata as an obstacle to economical stripping and at the same time has so eased the job of the handling equipment that maintenance costs have declined.

Mr. McCloud described the blasting methods recently developed at the strip operation of the Pyramid Coal Corp. near Pickneyville, Ill., using L.O.X. as the explosive. The average overburden is 35 to 40 ft. thick. —*Coal Age.*

New Crushing Plant

THE SOUTHERN Lime Products Co., Cordele, Ga., is building a new 250-ton per hour crushing plant near Cordele. It was designed and is being built by the Chas. C. Steward Machinery Co., Birmingham, Ala., who are furnishing all of the equipment excepting the crusher, which is a Williams hammer mill. The plant is expected to be in operation by April 1.



Panorama of the new 6000-bbl. per day cement mill recently erected by the Erste Nederlandische Cement

Holland's First and Only Cement Plant

New 6000-Bbl. Mill Established Near Maastricht

HOLLAND until very recently was one of the few countries which did not have its own cement industry. Lack of extensive raw material deposits prevented such development so that Holland had to purchase all its cement requirements from foreign countries. But in the rolling formation of Limburg county in the St. Pietersberg hills, near Maastricht, there were large deposits of chalk. Further, and of greater importance, these deposits are located quite close to the Maas river and to the Maas canal, thus having an advantage of low hauling costs for the required clay, coal and gypsum, and also low shipping costs for the finished product to the market of a future plant. These conditions resulted in the formation of the "Erste Nederlandische Cement Industrie" (Enci) at Maastricht, which company has built a cement plant of 6000 bbl. per day initial capacity.

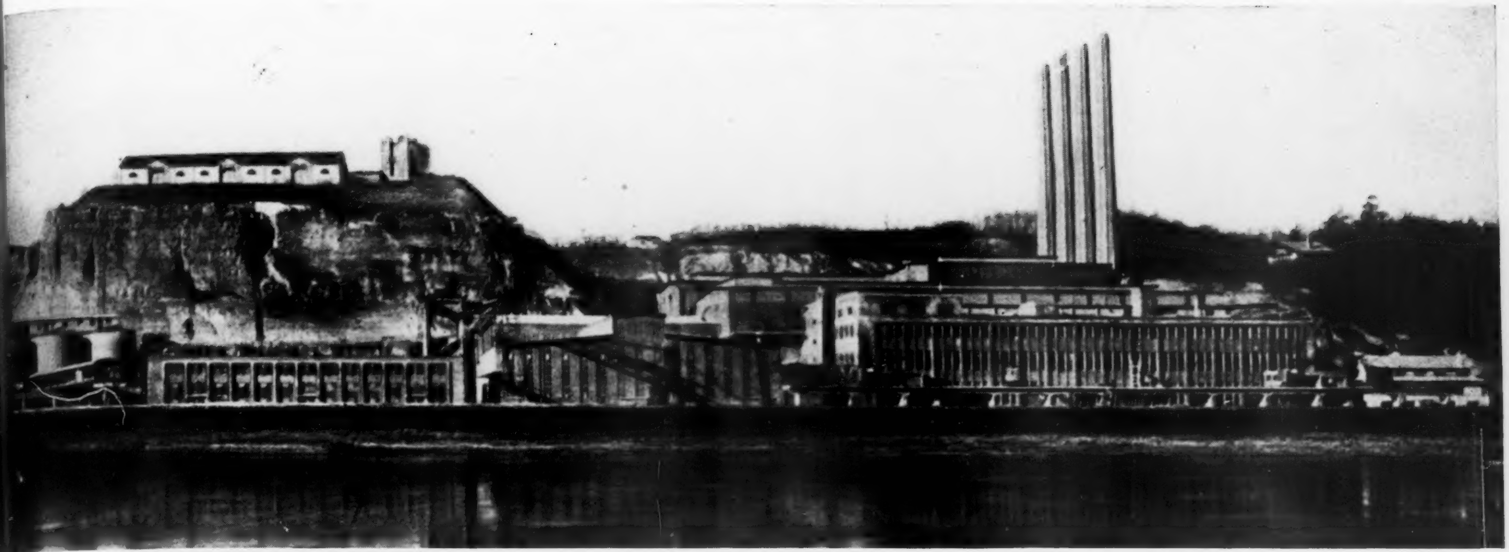
Designed for Large Capacity

The plant, put in operation in 1929, is remarkable from the European standpoint, because it is one of the largest modern cement plants built and operated with so large a capacity. Equipment in the new mill is of the most modern European type, designed to meet the requirements of efficient operation and supervision. For this purpose the "Solo" principle (combination of a number of operations into one machine) and large units have been used. The simplification is shown especially in the grinding departments where all the mills for raw grinding and finish grinding as well as the coal grinding departments are three-compartment mills of the "Solo" type. These mills are of the same size throughout the plant and considering that there are 10 mills in all, there is a decided advantage as far as the operation and the spare parts questions are concerned. Wherever possible, the machines are driven by individual direct connected motors. Few elevators and screw conveyors are used; rather, belt and pan conveyors for the coarse materials and centrifugal pumps and pneumatic conveying systems for slurry and the fine ground materials. The unloading of raw materials, such as clay, gypsum and coal, their storing and feeding to the first handling departments, are arranged by bridge cranes and overhead trackage, both equipped with grab buckets.

Packing plant and outside machinery for loading canal boats

Limited Plant Area

For the plant site, there was only a narrow strip of land between the chalk deposit and the Maas canal. Thus in order to make use of a long water front, the layout of the plant shows the considerable length of about 1200 ft. with little depth. Nevertheless, for some buildings, space had to be made by blasting away the face of the deposit. The accompanying illustration shows the general front view of the plant as seen from the far side of the Maas river.



Industrie at Maastricht, Holland. The mill site is over 1200 ft. long along the canal, with but little depth

Both raw materials, the chalk of the St. Pietersberg hills and a plastic clay hauled by ships, are easily washed, so the wet process of manufacture was selected.

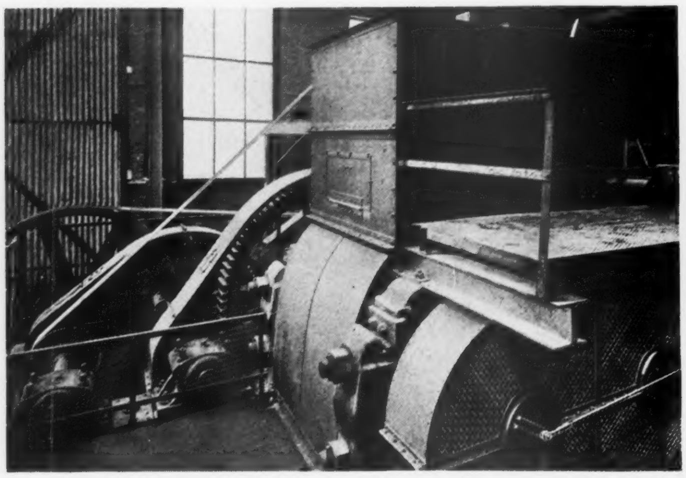
The chalk deposit has about 10 ft. of overburden. This is removed by crawler-mounted steam shovels and loaded into cars which carry the strippings to the dump. Chalk is excavated in the upper part of the quarry and loaded by steam shovels into dump cars for carriage to the crushing plant. Large chunks of chalk up to 35-in. by 20x 20-in. size are crushed to about 8-in. in a 5-ft. two-roll crusher, each roll of which is 5 ft. in dia. A hammer mill crusher of the "Solo" type is provided to reduce about 500 tons of chalk per day, which is for another purpose.

The crushed chalk is transported by an inclined belt conveyor of about 300 ft. in length to the wash mill department and is there discharged to a second belt conveyor, which is movable and reversible. This conveyor feeds the four bins above the wash mills. The design of the movable and reversible belt conveyor is quite interesting in that its driving motor serves to move the whole conveyor as well as run its belt in both directions. On account of this arrangement the belt conveyor can feed four bins without a tripper, always discharging material over its end.

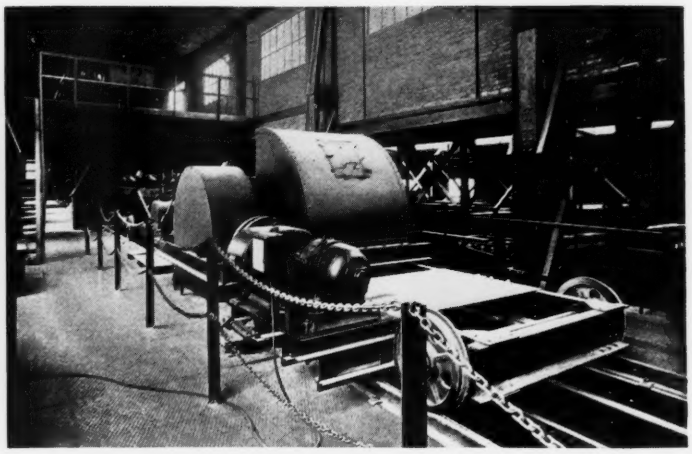
The chalk bins are about 30 ft. high and discharge to adjustable table feeders, each of 100-in. dia., feeding the wash mills. These latter are hexagonal tanks, the inner circle diameter being about 30 ft.

Above the last two wash mills are four smaller bins for the clay which is brought in by bucket cranes either direct from the ship or from the clay storage. After a separate washing, the clay slurry is pumped to the chalk wash mills by centrifugal pumps in such quantities as to afford a preliminary check of the mixture. The mixed raw slurry is collected in a slurry pit along the wash mills and is pumped from there by four double "Pressors" (compressed air pumps) to two blending tanks of 30-ft. dia. Slurry agitation is by compressed air. Centrifugal pumps then force the slurry to an overflow tank from which the raw mills are fed.

Part of the chalk quarry located behind the mill buildings



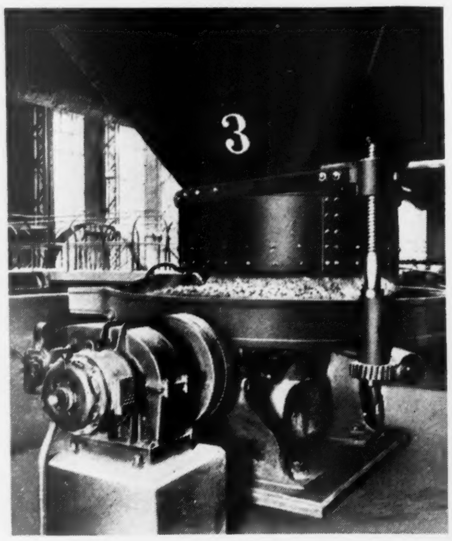
Double-roll crusher for reducing chalk



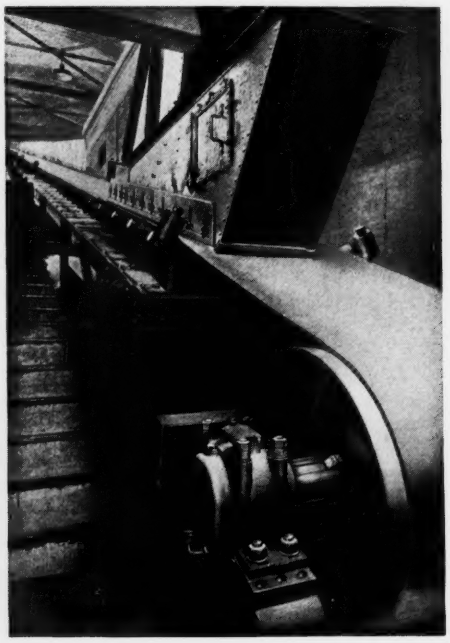
Reversible belt conveyor feeding wash mill bins

For the fine grinding of the raw slurry there are three wet-grinding three-compartment "Solo" mills each of 6 ft. 7 in. dia. and 42 ft. length. The mills are each supported on two trunnions and driven by direct connected motors at the feed end. Each raw mill has a double "Pressor" for pumping the finished slurry from a slurry pit under the discharge end of the mill to six slurry tanks of 30 ft. dia. and 48 ft. height, which are equipped with compressed air mixing systems. From the finish mixing tanks the slurry enters two other double "Pressors" which pump the slurry through a pipe line of about 750 ft. length to the kiln house.

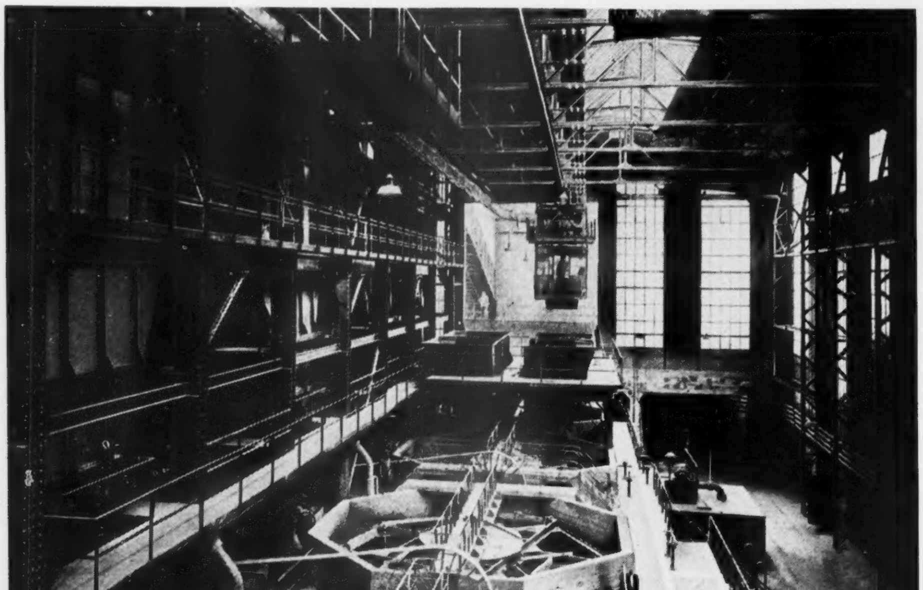
The kiln department consists of four rotary "Solo" kilns with cooler attached. The straight section of each kiln is of 9 ft. dia., the enlarged clinkering zone of 12 ft. dia. and the cooling zone of 10 ft. dia. The total length of each kiln, including cooler, is about 230 ft. The kilns as shown in the illustration rest on five trunnions with spring supports for the main gear rings. All kilns are fired with low-volatile pulverized coal by means of a single coal pipe with burner tip of heat resisting metal attached; the total unsupported length of the nozzle is about 40 ft. The coal feeding pipe can move backwards and forwards and can also be turned on its own axis. Flue dust is taken care of by electrical precipitation.



Chalk is fed from bins to the wash mill by table feeders



The roll crusher discharges to this belt conveyor, which in turn feeds a movable, reversible conveyor (see above)



Wash mills for clay and chalk

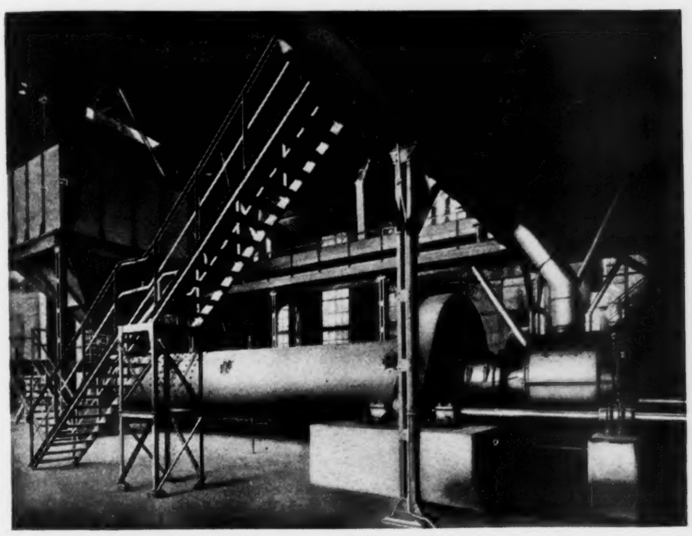
Coal for the kilns is brought in by boat and put into open storage by means of a large bridge crane equipped with a clamshell bucket. Belt conveyors and elevators convey the coal from storage to the three drying drums, each of 6 ft. dia. and 52 ft. in length. The dried coal quantity is controlled by weighing machines and then ground in two three-compartment "Solo" mills of 6 ft. 7 in. dia. by 42 ft. in length.

After grinding the pulverized coal is pumped to the kiln house.

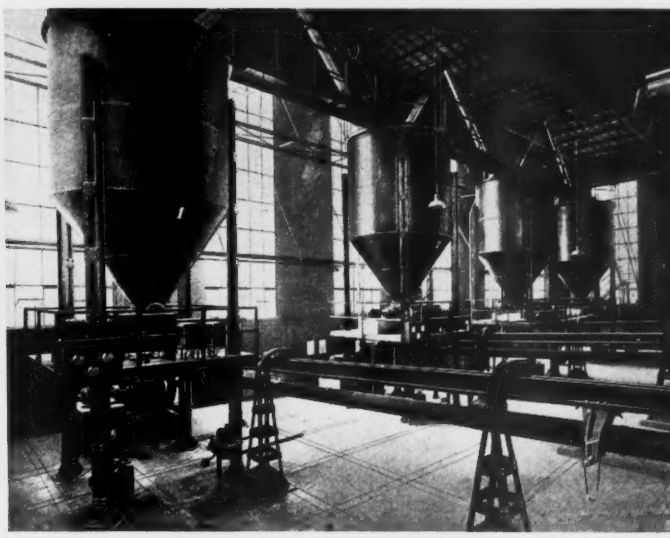
Clinker is discharged from the kilns into two pan conveyors, each of about 120 ft. length, which serve to carry the clinker to two 36-in. two-roll clinker crushers. Elevators feed the crushed clinker to automatic belt conveyors 300 ft. long and located about 80 ft. above the clinker storage floor. By the means of trippers these belt conveyors can discharge at any point. The clinker storage is divided into three sections, one for ordinary or standard portland cement clinker, another for "super cement" clinker and a third section somewhat smaller for gypsum. Discharge of the clinker storage is arranged by belt conveyors underneath with adjustable gypsum feeders.

For the finish grinding, five three-compartment "Solo" mills each of 6 ft. 7 in. dia. and 42 ft. length are used. The finished product (ground clinker) is collected by screw conveyors and pumped to the cement

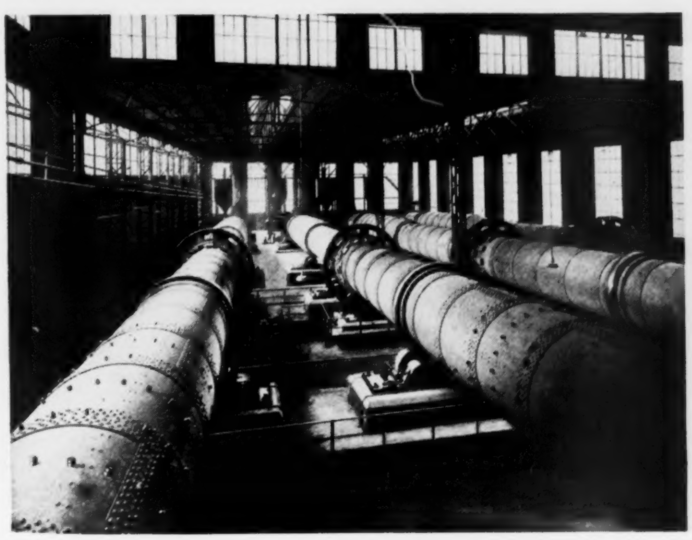
Raw slurry tanks with compressed-air agitating equipment in housing above



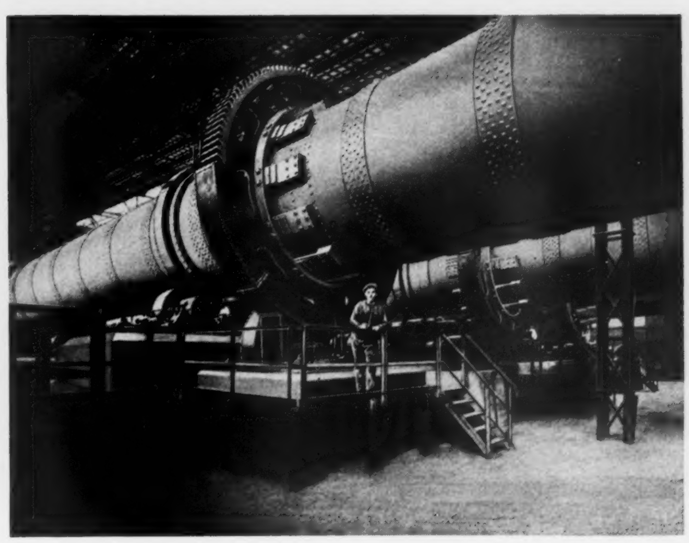
Interior of the coal pulverizing department showing the three-compartment tube mill for grinding coal



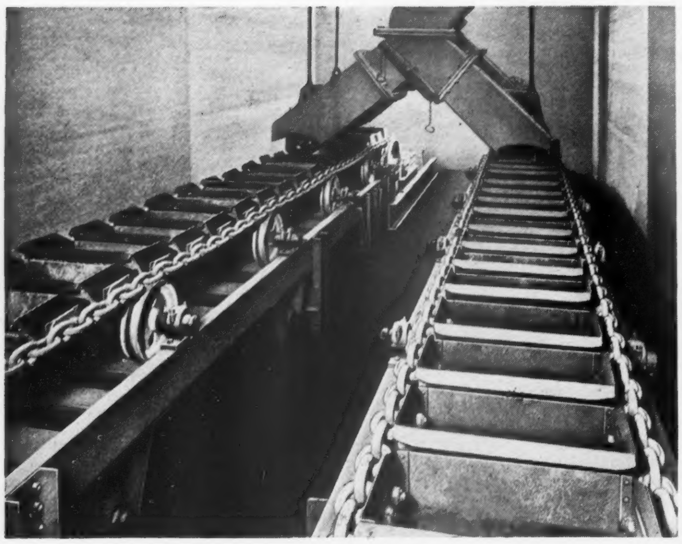
Firing platform showing feed bins, control instruments and adjustable feed pipe



There are four rotary kilns, each 230 ft. long, with enlarged clinkering and cooling zones

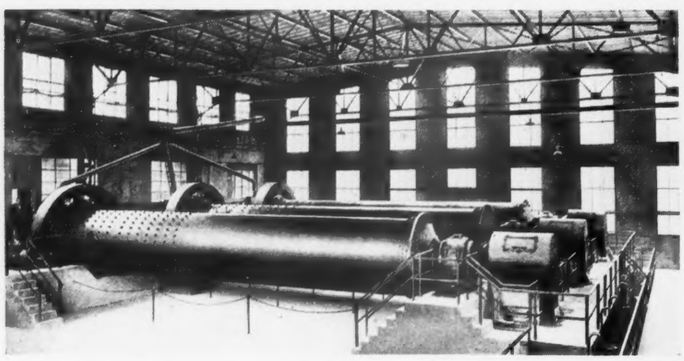


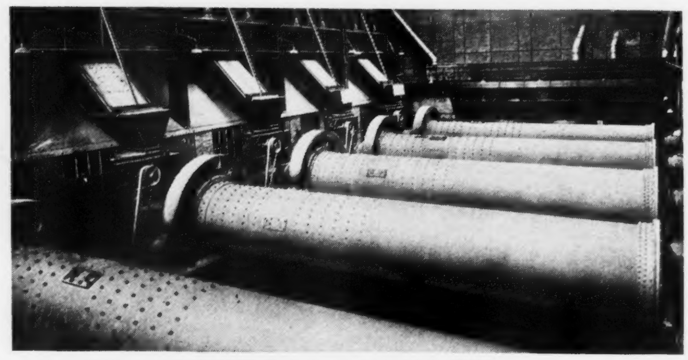
Each kiln rests on five trunnions with spring supports for the main gear rings



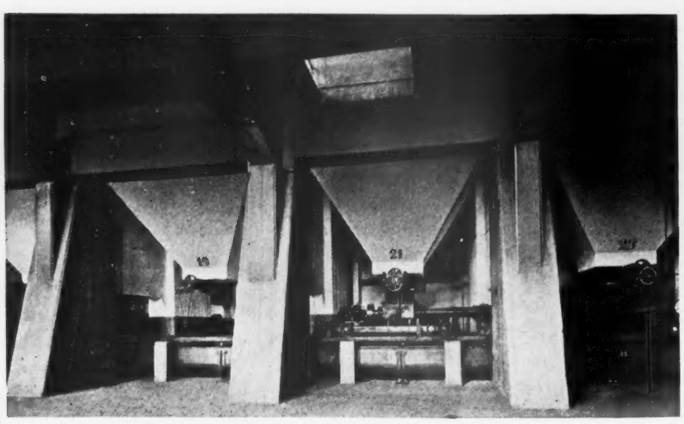
Pan conveyors under the kilns

Belt conveyor under the crushed clinker storage

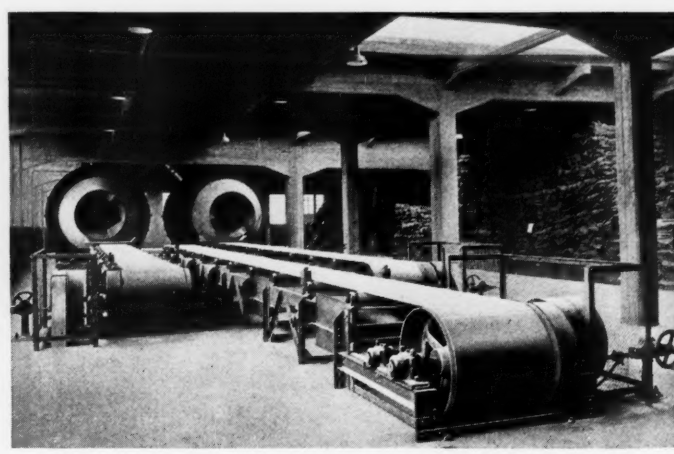




The three wet-grinding raw mills (left) and five finish grinding mills (right)

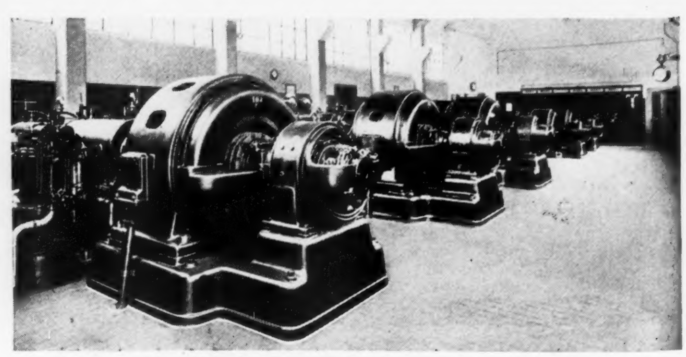


Discharge equipment under the cement bins



Rotary bag cleaner in the packhouse

Driving motors for the finishing mills



Air compressors and control panel

bins, of which there are 24, each of 17 ft. by 17 ft. base. Bins are discharged by movable double screw feeders driven by variable speed motors and by screw conveyors underneath. The finished cement is pumped to the three-floor packhouse in which four two-tube Bates packers and bag cleaning machinery have been installed. An efficient dust collecting system keeps the plant free from dust.

A well equipped testing and control laboratory takes care of the quality of the product. There is a modern machine shop, transformer substation and compressor room. The office is at the plant.

The plant layout has been designed to permit future expansion by the addition of two more raw mills, two more kilns and five more clinker grinding mills. Entire design of the plant and installation of the machinery was by G. Polysius, A. G., Dessau, Germany, which company also furnished practically all the equipment.

Foreign Rock Products Developments

THE Wolyn cement mill in Zdolbunowo, Poland, destroyed during the war, has been rebuilt to supply eastern Poland and export to Russia and Roumania.

Beirut, Syria, is to have a new cement mill of 250,000 bbl. annual capacity. The builders are the Chaux et Ciments de Levant, Beirut.

The Societe des Chaux et Ciments du Senegal, a new fr. 5,000,000 company, has been organized in France for the production of cement, lime and other rock products near Dakar, and other French colonies in Africa.

Tunis, Algeria—A lime and cement plant is to be erected in Hamman-Lif near Tunis with modern equipment to supply Tunis and Tripolis.

Brugg, Switzerland—A new company has been formed in Hausen for the manufacture of cement and similar products; the plant is now being built.

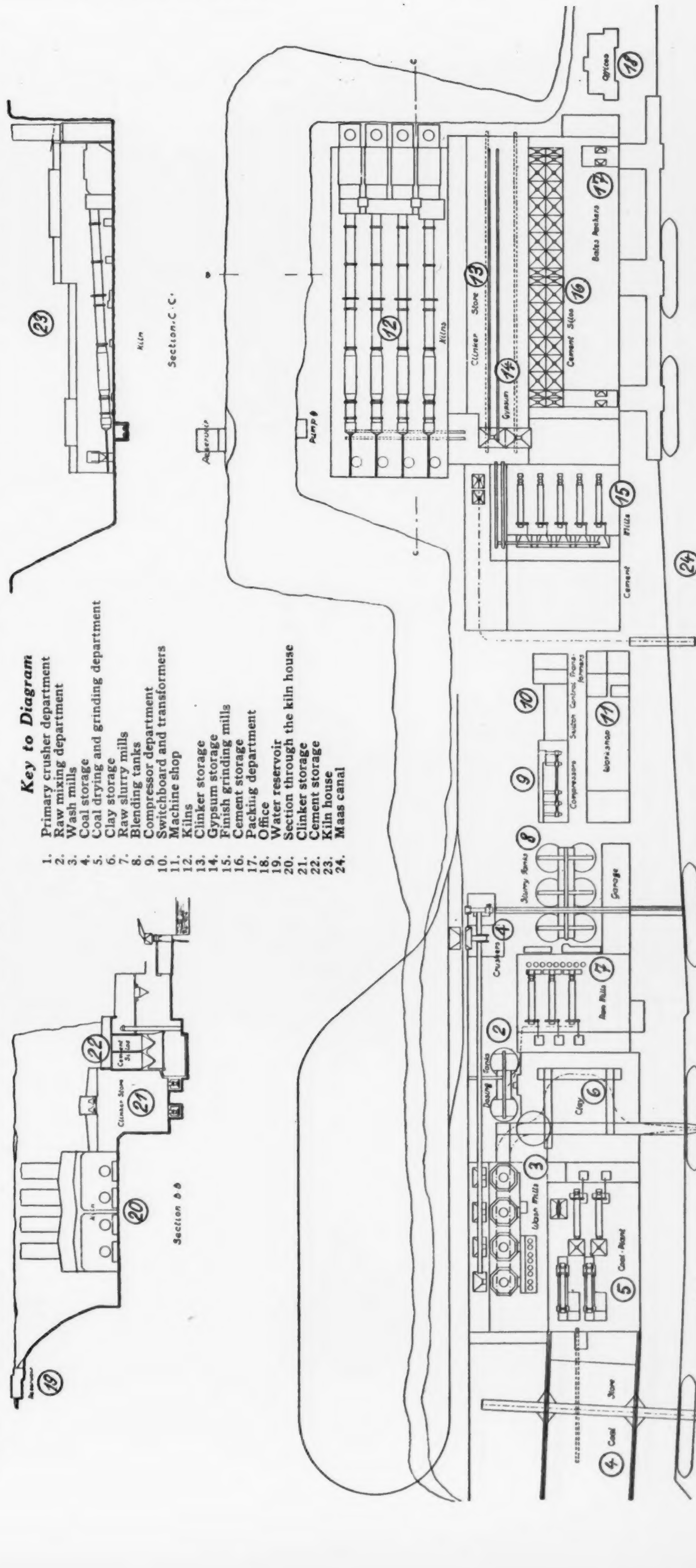
Adelaide, Australia—Adelaide Cement Co. intends to build a plant of 60,000 tons annual capacity; present output is 48,000 tons.

Margecany, Czechoslovakia—New deposits of excellent raw materials for cement production are said to be uncovered near Margecany, Czechoslovakia. A corporation has been organized to erect a plant for the utilization of these raw materials.

Herrenwyk, Germany—Based on many years of experiments, a new process for obtaining bauxite cement is said to have been developed at the Roland furnace of the blast furnace works Luebeck A.-G., Herrenwyk.

Carandahy, Brazil—Brazil-Swiss interests reported planning a cement plant in Carandahy, Minas Gueraes, Brazil.

Kartal, Asia Minor—F. L. Smidth and Co., Copenhagen, and an unnamed Belgian firm are reported to be planning the erection of a cement mill in Kartal.



Key to Diagram

1. Primary crusher department
2. Raw mixing department
3. Wash mills
4. Coal storage
5. Coal drying and grinding department
6. Clay storage
7. Raw slurry mills
8. Blending tanks
9. Compressor department
10. Switchboard and transformers
11. Machine shop
12. Kilns
13. Clinker storage
14. Gypsum storage
15. Finish grinding mills
16. Cement storage
17. Packing department
18. Office
19. Water reservoir
20. Section through the kiln house
21. Clinker storage
22. Cement storage
23. Kiln house
24. Maas canal

General ground plan of the "Enci" cement mill at Maastricht, Holland, showing locations of principal buildings and equipment

Fine Grinding of Portland Cement Materials

Adaptability of Various Sized Grinding Media for the Fine Grinding of Portland Cement Raw Mixtures and Clinker

By Alton J. Blank

Formerly Chief Chemist, La Tolteca Cia. de Cemento Portland, S. A., Tolteca, Now General Superintendent and Supervising Chemist, Compania de Cimento Portland Landa, Puebla, Puebla, Mexico

IN THE FINE GRINDING of portland cement materials it is of especial interest to note the variety of results that may be received in way of output and power consumption by the use of various sized grinding media in the loading of tubemills.

It is generally known that too large or too small sized grinding media do not give the most efficient grinding results, though for the various sized fine grinding mills the size of grinding media giving the best results must be found through experimenting.

At a plant some months ago, due to a shortage of the regular sized grinding media, it was necessary to load certain raw and finish grinding tubemills with 1½-in. round balls. These grinding media were kept in the mills for a period consisting of several months, for the purpose of obtaining comparative results in the way of outputs and power consumptions to check against the results previously obtained when the same mills were loaded with ⅞-in. to 1¼-in. round balls.

A summary of the results obtained on the test revealed that the mills on the raw end gave outputs of 600 kilos per hour less, and power consumptions of 2.1 kw. greater per metric ton of output, when compared with past performance of the mills loaded with ⅞-in. to 1¼-in. round balls.

A summary of the results obtained on the test carried out on the finish grinding tube mills showed that the output average 1000 kilos less per mill hour, and that the power consumption was 5.4 kw.h. greater per ton of cement ground during the period the 1½-in. round balls were used in the mills, and this was accompanied by a slight drop in the fineness.

Variations in Grinding Media Increased

In view of the variation in the results obtained from the mills when charged with the different sized grinding media, it was decided to carry out a thorough test on all of the available grinding media, to determine which size and shape was best adapted for reduction of the materials in question. To that end a general sample of clinker was obtained and ground to normal tube-mill feed fineness, and tests were carried out in a 12x12-in. experimental laboratory ball mill.

Factors entering into the grindability tests on the various sizes of balls and slugs employed were in each test constant, and may be stated here as follows:

1. The revolutions of the tubemill for all tests remained constant, being 64.0 r.p.m.
2. The grinding time consisted of five 15 minute periods for each test, or a total of 75 grinding minutes.
3. The material ground during each test consisted of a general sample of clinker of uniform fineness on the various sieves.
4. The amount of material ground in each test was 2½ kilos.
5. The weight of grinding media placed in the mill was kept constant at 16.0 kilos.
6. Screen analyses were made at the end of each 15 minute grinding period during the various tests, and an average sample consisting of 100 grams of the

TEST NO. 1

Mesh of sieve	Fineness, original sample, % passing	Grinding periods of 15 minutes					Per cent reduction
		15 min.	30 min.	45 min.	60 min.	75 min.	
14	93.5	100.0	100.0	100.0	100.0	100.0	0.0
20	77.5	99.1	100.0	100.0	100.0	100.0	0.0
48	41.5	83.4	99.6	99.9	100.0	100.0	0.0
100	24.0	49.3	72.3	87.3	95.1	97.9	73.9
200	16.0	33.2	48.7	60.9	71.8	77.8	61.8

TEST NO. 2

Mesh of sieve	Fineness, original sample, % passing	Grinding periods of 15 minutes					Per cent reduction
		15 min.	30 min.	45 min.	60 min.	75 min.	
14	93.5	100.0	100.0	100.0	100.0	100.0	0.0
20	77.5	99.9	100.0	100.0	100.0	100.0	0.0
48	41.5	83.7	99.5	100.0	100.0	100.0	0.0
100	24.0	50.7	72.2	88.6	96.8	97.5	73.5
200	16.0	34.8	48.2	61.7	72.2	79.5	63.5

TEST NO. 3

Mesh of sieve	Fineness, original sample, % passing	Grinding periods of 15 minutes					Per cent reduction
		15 min.	30 min.	45 min.	60 min.	75 min.	
14	93.5	99.7	100.0	100.0	100.0	100.0	0.0
20	77.5	98.9	99.2	100.0	100.0	100.0	0.0
48	41.5	83.9	99.5	100.0	100.0	100.0	0.0
100	24.0	53.2	76.5	92.0	98.0	99.5	75.5
200	16.0	36.4	53.2	67.5	78.7	84.8	68.8

TEST NO. 4

Mesh of sieve	Fineness, original sample, % passing	Grinding periods of 15 minutes					Per cent reduction
		15 min.	30 min.	45 min.	60 min.	75 min.	
14	93.5	97.7	98.1	98.4	99.2	99.5	......
20	77.5	90.5	93.6	95.8	98.2	99.3	......
48	41.5	63.7	75.5	88.7	97.1	99.0	......
100	24.0	45.0	57.2	70.8	93.0	98.6	74.6
200	16.0	32.4	43.7	56.7	74.7	89.9	73.9

TEST NO. 5

Mesh of sieve	Fineness, original sample, % passing	Grinding periods of 15 minutes					Per cent reduction
		15 min.	30 min.	45 min.	60 min.	75 min.	
14	93.5	97.2	98.7	99.1	99.6	99.9	......
20	77.5	90.6	93.9	96.1	97.9	99.3	......
48	41.5	63.1	71.9	82.5	93.2	98.4	......
100	24.0	43.9	54.8	67.2	79.7	94.8	70.8
200	16.0	30.8	42.7	53.8	66.2	79.1	63.1

TEST NO. 6

Mesh of sieve	Fineness, original sample, % passing	Grinding periods of 15 minutes					Per cent reduction
		15 min.	30 min.	45 min.	60 min.	75 min.	
14	93.5	98.6	98.7	99.0	99.4	99.7	......
20	77.5	93.3	95.7	95.9	98.5	99.5	......
48	41.5	75.0	87.3	94.6	97.6	99.2	......
100	24.0	54.7	70.7	85.4	95.3	98.7	74.7
200	16.0	41.5	53.9	67.6	77.8	91.6	75.6

TEST NO. 7

Mesh of sieve	Fineness, original sample, % passing	Grinding periods of 15 minutes					Per cent reduction
		15 min.	30 min.	45 min.	60 min.	75 min.	
14	93.5	99.1	100.0	100.0	100.0	100.0	......
20	77.5	99.9	100.0	100.0	100.0	100.0	......
48	41.5	91.3	99.1	100.0	100.0	100.0	......
100	24.0	54.3	82.7	95.9	98.6	99.5	75.5
200	16.0	36.2	54.2	67.3	78.7	86.1	70.1

TEST NO. 8

Mesh of sieve	Fineness, original sample, % passing	Grinding periods of 15 minutes					Per cent reduction
		15 min.	30 min.	45 min.	60 min.	75 min.	
14	93.5	99.7	100.0	100.0	100.0	100.0	......
20	77.5	98.2	99.1	100.0	100.0	100.0	......
48	41.5	75.5	97.7	100.0	100.0	100.0	......
100	24.0	48.9	70.2	91.9	98.9	99.7	75.7
200	16.0	34.0	49.3	64.3	81.5	92.0	76.0

TEST NO 9

Mesh of sieve	Fineness original sample, % passing	After 75 minutes of continuous grinding	Per cent reduction
14	93.5	97.4	......
20	77.5	90.7	......
48	41.5	72.8	......
100	24.0	65.2	41.2
200	16.0	58.8	42.8

material under test was used in the making of each screen analyses.

Test No. 1—Mill was loaded with 16.0 kilos of 1½-in. round balls, which weight corresponded to a total number of 66 balls, or 1.8 balls per lb.

Test No. 2—Mill was loaded with 16.0 kilos of the same type balls used in Test No. 1, these balls having been worn to sizes from 1-in. to 1⅜-in., which weight corresponded to a total number of 130 balls, or 3.6 balls per lb.

Test No. 3—Mill was loaded with 16.0 kilos of same type balls used in Tests No. 1 and 2, these balls having been worn to sizes of ¾-in. to 1-in., which weight corresponded to a total number of 341 balls, or 9.7 balls per lb.

Test No. 4—Mill loaded with 16.0 kilos of round balls worn to sizes from ⅜-in. to ¾-in., which weight corresponded to a total number of 864 balls, or 24.5 balls per lb.

Test No. 5—Mill loaded with 16.0 kilos of slugs worn to sizes from ⅜-in. by 1¼-in. to ⅝-in. by 1¾-in., which weight corresponded to a total number of 768 slugs, or 21.8 slugs per lb.

Test No. 6—Mill loaded with 16.0 kilos of slugs and Concavex balls, composed of 8 kilos which weight corresponded to a total number of 1170 slugs, or 33.2 slugs per lb.

Test No. 7—Mill loaded with 16.0 kilos of new Concavex balls, in sizes of 1x1¼-in., which weight corresponded to a total number of 130 balls, or 3.6 balls per lb.

Test No. 8—Mill loaded with 16.0 kilos of slugs and Concavex balls composed of 8 kilos of slugs ½x½-in. to sizes ½x¾-in. as used in Test No. 6, which weight corresponded to 585 slugs. Also 8 kilos of Concavex balls 1x1¼-in. as used in Test No. 7, weight corresponded to 65 balls. Therefore total charge of 16.0 kilos of Concavex and slugs numbered 650, or 18.4 balls and slugs per lb.

Test No. 9—Mill loaded with 16.0 kilos of balls that had been worn flat to the size approximating ⅛x¾-in., this weight corresponding to a total number of 1904 flat balls, or 54.0 flat balls per lb.

The above test data are given for what they are worth to the reader, other experimenters along this line having received entirely different results through usage of various sized grinding media.

However, in the operation of the 6- x 22-ft. tube mills in the cement plant in question, where the mills were of the two-compartment type, it was found that with a normal fineness tube mill feed comparable with that used in the above tests, a charge of Concavex, or of round balls of the same diameter in the preliminary compartment, and a charge of normal sized slugs in the secondary compartment, gave the best mill efficiencies in way of output, fineness and power consumption.

In another plant where small tube mills have been made into compartment mills, it has been found (feed entering mills grinding raw materials is material direct from hammer mills, which average ½-in. and down) that by loading the preliminary compartment with 2x3-in. slugs, and the secondary grinding compartment with ⅝x1¼-in. slugs, more efficient grinding is had than is possible when the preliminary compartment is loaded with 3-in. to 2-in. round balls, and the secondary compartment is loaded with normal 1x1¼-in. Concavex balls.

Incidentally, with the same mill during a period when only 16 ft. of the length was used, it was found that a mixture of round balls and Concavex in diameters from 3-in. to 1¼-in. gave better grinding efficiencies than were received when the same length of mill was loaded with rods varying in diameter from 3-in. to 1¼-in. However, while this size mill and loading is suitable for the coarse grinding of materials ranging in size from ⅝-in. and down to a discharge fineness of 40% passing the No. 200 mesh, the short length and large diameter of grinding media is not adaptable for finer grinding.

Dust Collection Improves Product

DUST COLLECTION is usually considered only from its effect on the health of the men and on the surroundings of the plant. The economical value is generally thought of as due to a saving in material. However, there is sometimes an additional gain due to an improvement of the plant product.

A good example is found in the experience of the Humphreys Coal and Coke Co. as described in the November, 1929, issue of *Coal Age*. This company made coke by the somewhat old-fashioned beehive process and found it impossible to compete in quality with byproduct coke. By cleaning the coke with a pneumatic process and collecting the resultant dust the quality was greatly improved. In addition to cleaning, desulphurring by a chemical process improved the coke, both together raising its selling price 12%.

Pneumatic cleaning is a concentrating or separating process employing currents of air to stratify the coal and minerals on a table. But its success calls for an efficient dust-collecting system. That chosen for use in this case was of the air filter type. The dust laden air is passed through a classifying section, where the coarser coke is dropped, and then through frames covered with fine wire cloth. These are cleaned periodically by a mechanism which gives them a slight whipping motion.

Air cleaning to improve the product has also been used in the rock products industries. As the product is coarser and stronger structurally than coal, in most cases, the equipment may be of the simplest. Running the crushed rock over inclined screens through which a blast of air passes has been found to work well.

Microscopic Measurements of Fine Particle Sizes

A METHOD of particle-sizing, including particles from colloidal dimension up to sieve dimensions, is described in a recent issue of *Industrial and Engineering Chemistry*. The method is particularly applicable to fine powders. Images of the particles are projected through a microscope on to a screen, where the particles are measured and classified. Changing of focus (by remote control) facilitates the work and permits the accurate measurement of each particle throughout the depth of the mount. Different types of mounts are described, and the calculations based on spherical particles illustrated by a form sheet.

The object of one supplementary method to the above is to separate the coarse material and size the coarse and fine portions separately. It is necessary to have a good clean separation of sizes in order to be of the most aid. Any standard classifier or elutriator, such as the Thompson classifier, may be used to separate the coarse and fine particles. The classified portions are sized separately. When a classifier is once calibrated for a material, the classification test is very valuable. Classifiers or elutriators are of great utility for materials where most of the particles are coarser than 5 or 10 microns.

An electroplated screen with a sieve aperture of approximately 24 microns is being used to separate particles coarser than approximately 30 microns, on 1- to 3-gram portions of the sample. Microscopic analysis shows the screen to be quite accurate. Finer screens than this have been made, and further work is being done along this line, as it appears to be the easiest method of separating sizes.

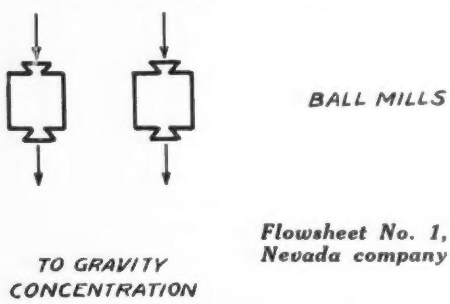
Another method of making a separation of sizes at a definite size of particle is by repeating settlings and decantations on a definite weight of sample in suspension. Stokes' law is used to calculate the rate of falling for the size of particles to be separated. The particles are dispersed or peptized in a dispersing medium, well stirred and allowed to settle the proper distance for the calculated amount of time. The supernatant liquor between the marked distances on the settling tube is then decanted or siphoned off or allowed to run off through a side-arm control into a storage dish. This procedure is repeated until the supernatant liquor between the marked distance on the settling tube is clear after settling the calculated amount of time. Generally nine settlings give a clean separation. The accumulated portions are filtered, dried and weighed. Each residue is sized separately. If the material contains flaky particles, the separations will overlap.

The article gives a number of diagrams and explains several aids to the methods described.

Fine Grinding Practice Discussed at Mining Engineers' Meeting

By A. Anable
Engineer, The Dorr Co., New York

AT THE fall meeting of the American Institute of Mining and Metallurgical Engineers, held in San Francisco, October 7 to 10 inclusive, 1929, several technical papers were presented on fine grinding and classification practice. In probably no industry has the art of fine grinding reached a higher state of development than in metallurgy, where the cost of grinding mineral bearing ores to the requisite fineness for concentration treatment has always been one of the largest items in metal recovery. Certain of these papers, particularly that of J. V. N. Dorr, president of the Dorr Co., New York,



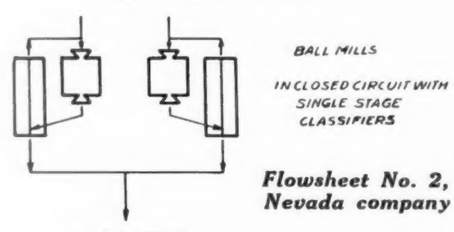
Flowsheet No. 1, Nevada company

should be of interest to cement manufacturers, since the tendencies in practice toward finer and finer grinding, the reductions in grinding costs being made, and the arrangement of equipment discussed in this paper all have a bearing on possible improvements in raw grinding technique in the cement industry.

Mr. Dorr's paper, "The Importance of Classification in Fine Grinding," reviewed recent developments in the application of advanced classification practice to the origination of fine grinding flow sheets and traced the history of the mechanical classifier from its original application to its present six or more distinctly different applications in modern multiple stage fine grinding plants.

The data upon which Mr. Dorr's paper is based were secured through a comprehensive field study of past and present fine grinding and classification practice at nine representative copper properties in the western portion of the United States. The greater part of the paper is devoted to a study of diagrams showing the different arrangements of mills and classifiers used at different times at these plants. A total of 27 different flow sheets have been used by these nine plants during the past 10 years and the proper critical operating data accompanies each flow sheet so that an accurate comparison may be made.

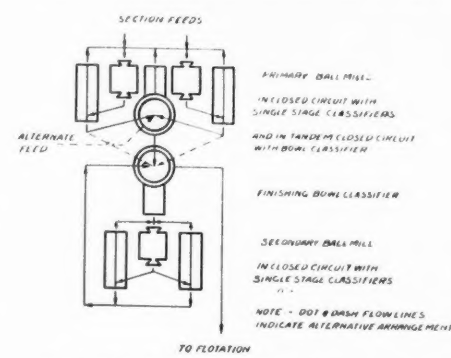
The wealth of plant operating data made available in Mr. Dorr's paper is said to show for the first time a comprehensive picture of the best practice in fine grinding as developed by a group of leading plants which have a daily milling capacity of nearly 125,000 tons of ore. Included in this analysis are the Nevada Consolidated Copper Co., the Phelps Dodge Co., the Utah Copper Co., Miami Copper Co., and others.



Flowsheet No. 2, Nevada company

It was shown that in the case of crushing, present practice favored final reduction in rolls in closed circuit with vibrating screens to ⅜ in. to ½ in. and in some instances to as fine as ¼ in. All plants abandoned open-circuit single-stage grinding years ago, and today, it was shown, two-stage closed-circuit grinding has been almost universally adopted. In certain cases three-stage grinding has been used with marked improvement. Finer grinding was the order of the day, Mr. Dorr said, most plants grinding all through 65-mesh, while in a few cases 100-mesh grinding was found necessary to unlock the mineral and the gangue before concentration.

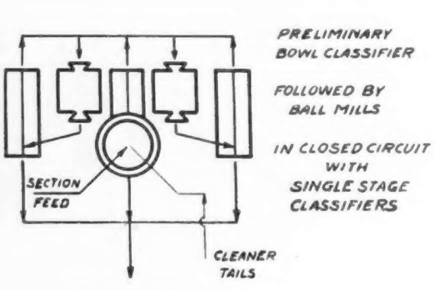
The basic principles which metallurgists

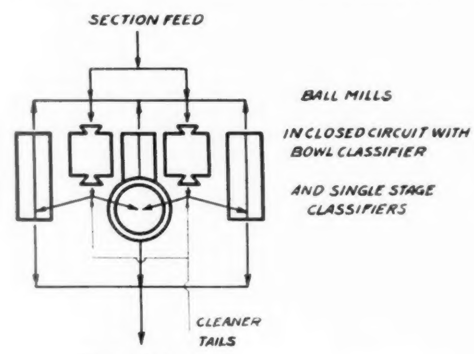


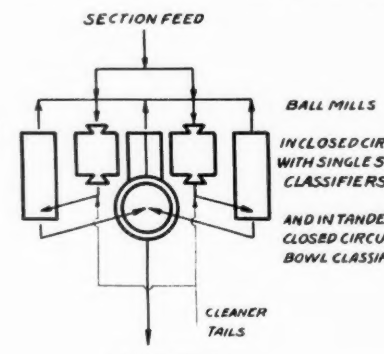
Flowsheet No. 6, Nevada company

are applying in the closer and closer solution of their grinding problems were shown to be the elimination of finished material from the system as soon as produced and the carrying of large circulating loads in the ball mill-classifier circuit. A study of the flow sheets shows that the application of these principles has resulted in the use of classifiers not only in circuit with all of the mills, but the use also of classifiers between the different grinding stages and ahead of the first stage so that material finished in the crushing plant may be removed at the outset.

The power required for grinding was the subject of particular study. For convenience in comparing the varied practices observed, three indices of comparison were selected, viz., kw.-h. per ton milled, kw.-h. per ton

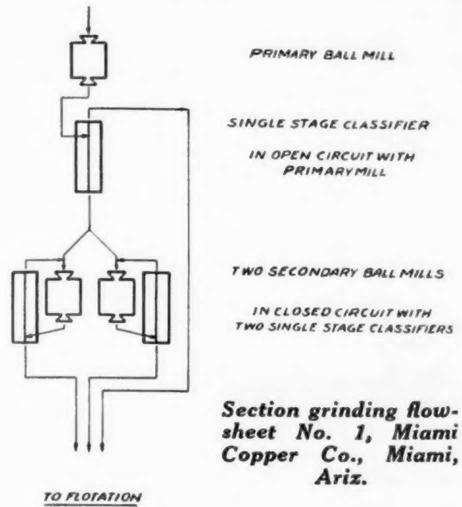






Left to right, half-section grinding flowsheets, Nos. 3, 4, 5 of the Nevada Consolidated Copper Co., McGill, Nev.

minus 100-mesh produced, and kw.-h. per ton minus 200-mesh produced. The latter two indices are based on screen analyses of the feed to the grinding plant and the discharge



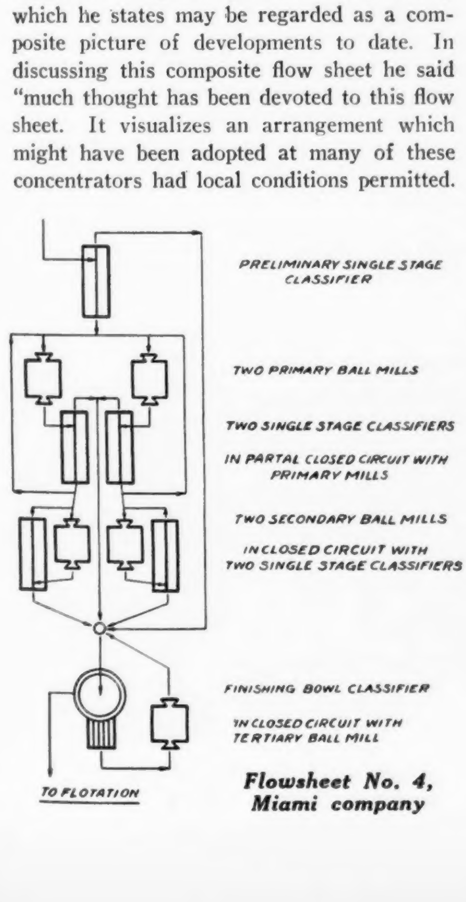
Section grinding flow-sheet No. 1, Miami Copper Co., Miami, Ariz.

therefrom, and accordingly represent work actually performed in the grinding and classification layout. A table giving these indices of comparison as applied to eight of the nine plants follows:

UNIT POWER CONSUMPTION FINE GRINDING

Plant	Kw.-h. per ton	—Kw.-h. per ton— 100-mesh	200-mesh
A	3.70	7.90	10.80
B	4.88	8.95	11.66
C	5.68	10.74	14.80
D	5.84	10.61	14.56
E	6.70	8.53	9.73
F	6.96	9.20	11.69
G	8.20	10.10	13.10
H	10.13	11.93	11.69
Average	6.51	9.74	12.25

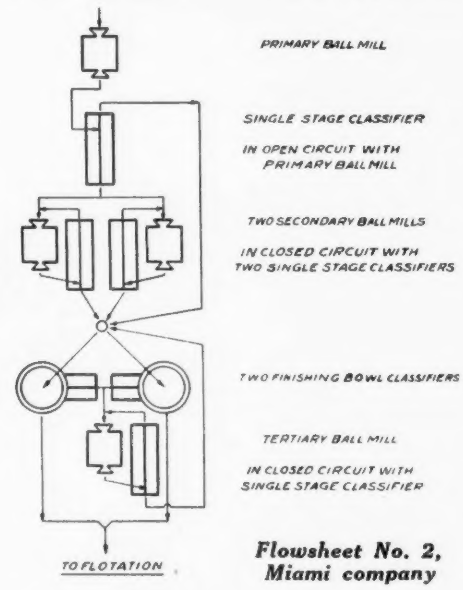
In his conclusions, Mr. Dorr discussed a suggested fine grinding flow sheet (see cut) which he states may be regarded as a composite picture of developments to date. In discussing this composite flow sheet he said "much thought has been devoted to this flow sheet. It visualizes an arrangement which might have been adopted at many of these concentrators had local conditions permitted.



Flowsheet No. 4, Miami company

It would seem, however, that the composite picture may offer a good basis for such discussion as may follow and perhaps serve as a stepping stone for further improvements."

Harlowe Hardinge, of the Hardinge Co., commented on his observations of crushing and grinding practice made during a recent trip through the mining districts of the southwest, central west and northwest. He stated that much attention is being given to



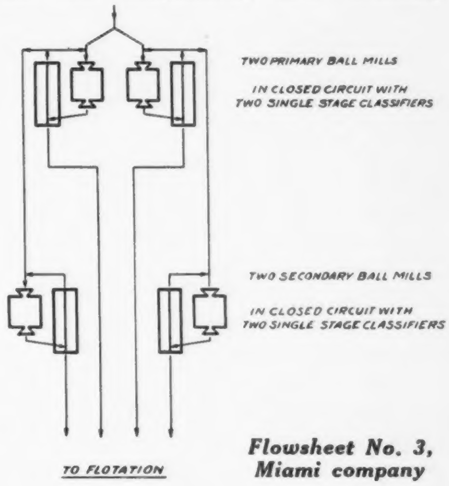
Flowsheet No. 2, Miami company

finer crushing and that the importance of stage crushing is recognized to a far greater degree than in previous years. "In a few cases," he remarked, "ball mills have taken feeds as coarse as 3 in. and thus saved one stage of crushing, but with the introduction of secondary crushers, such as the cone crusher, it is cheaper in almost every instance to crush ahead of ball mills to ½ in. and in some cases to ⅜ in."

It was pointed out that where several years ago it was considered ample to provide only one mill for fine grinding, today it is general practice to use two- and even three-stage grinding. Three-stage grinding apparently results in very evident economies.

Closed-circuit grinding is virtually universally used in metallurgy. Commenting on high circulating loads between mill and classifiers, Mr. Hardinge said: "A number of years ago experiments were conducted to determine the advisability of operating ball mills with high circulating loads in conjunction with suitable classifiers. The conclusion was drawn that, all other things being equal, the higher the circulating load the greater was the ultimate capacity of the unit, the limitations being the ability of handling the pulp and the actual power consumption of the classifier involved."

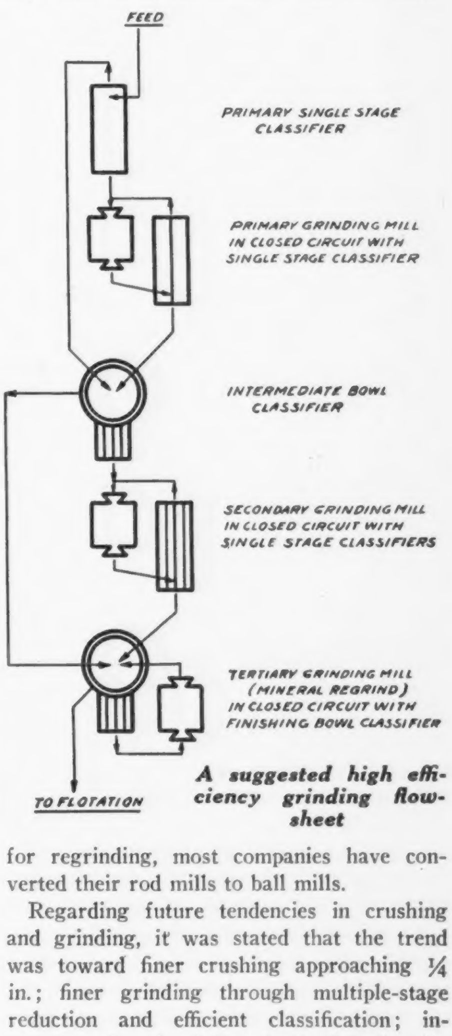
Regarding the recent discussion as to the character of the product produced by various types of mills, such as rod mills, trunnion overflow ball mills and low pulp discharge grated type ball mills, Mr. Hardinge said: "A close check among many operators who have operated two or more of these types of mills indicates without a question that there is practically no difference in character of product produced below 48-mesh when the mills are operated with efficient classifiers and with comparatively high circulating



Flowsheet No. 3, Miami company

loads." The tendency in ball mill design appears toward larger diameter mills, he said.

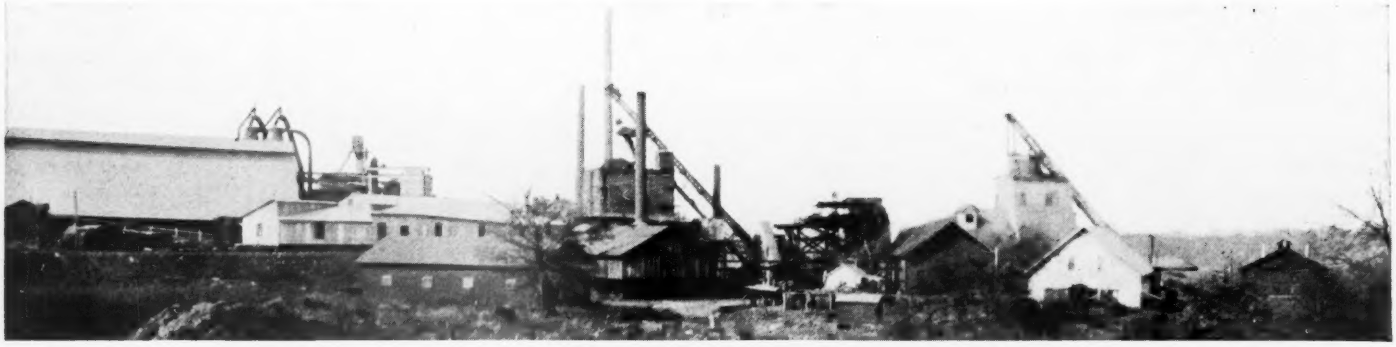
Discussing multiple-stage grinding practice, Mr. Hardinge stated that the rod mill still has its place as a relatively coarse grinder, and in a number of plants is doing very good work, but where it has been used



A suggested high efficiency grinding flow-sheet

for regrinding, most companies have converted their rod mills to ball mills.

Regarding future tendencies in crushing and grinding, it was stated that the trend was toward finer crushing approaching ¼ in.; finer grinding through multiple-stage reduction and efficient classification; increasing the circulating load of ball mills up to the maximum possible; and the use of larger equipment units.



The washing and pulverizing plant of the Hoover-Mason Co. at Mt. Pleasant, Tenn.

Phosphate Industry of Tennessee

Part II.—Concluding Article Describing Two of the Major Plants in the Mt. Pleasant District

By Walter B. Lenhart
Associate Editor, Rock Products

IN the issue of Rock Products for February 1, 1930, was published a general summary of conditions in the Tennessee phosphate districts, including a description of typical phosphate deposits. In the following article some of the other well-known plants are described.

The Hoover-Mason Co. Operation

This plant was described in the January 15, 1921, issue of Rock Products, and the mining and preliminary treatment of the rock is the same today. The inclined hoist, roll crushers, "mulcher" and rope-slung washing car were all described in that issue, and there have been practically no changes since that time.

The nature of the deposits are typical of the field. Stripping is done by Monighan dragline excavators of 1½- and 2½-cu. yd. bucket capacities, and the bulk of the phosphatic sands are loaded by this equipment. The cutters or crevices are mined by shoveling into pans, which are picked up by a cantilever crane that delivers the ore to the 4-yd. Western dump cars.

The second "mulcher" used at that time has been eliminated and some changes made in the flow of sands through the Allen cones, and in addition a Dorr classifier has been installed.

The heavy sands from the screen on the end of the can washer are now jetted to two settling cones operating in parallel, the sands discharging to a sump. The overflow from the can washer passes to six Allen cones, likewise operated in parallel, and the heavier particles are jetted to the same sump that received the sands from the can washer.

The overflow from the two settling cones goes back to the can washer basin, while the overflow from the six Allen cones passes to a settling trough located between the plant and the large outside mud ponds. The overflow from this trough goes to the mud ponds, and the settled sands discharge to the ground storage and are returned to the plant from time to time by means of a Variety locomotive crane.

The settled sands in the sump serving the two sets of Allen cones above referred to are pumped to the small Dorr continuous bowl classifier. The thickened sands from the classifiers fall to a small ground storage along with the lump rock from the end of the can washer, where the entire product of mixed lumps and fines is picked up by the Variety Iron Works crane and cast to the large storage pile for further air drying and drainage. The overflow from the Dorr classifier goes back to the can washer basin.

Drying Plant

The Variety crane, by means of a 1½-yd. clamshell bucket, reclaims the stored drained sands, loading them into a skip, and the product is elevated over an inclined track similar to that used for delivering the crude rock to the plant. This skip discharges to louvre type bins that serve four drum feeders, which deliver the wet sands to two rotary dryers.

The dryers in this plant are of the same type as used at other plants in the field and are not lined with any refractory material,

At the Hoover-Mason pit, the cantilever crane is used for lifting hand-loaded pans of phosphate material from the crevices or cutters

but have angled projections welded or bolted to the inside which pick up the material and let it drop through the hot gas stream. These dryers are fed at the hot end, a practice which is just the opposite to that at the Charleston company's plant previously described.

One of the dryers at this plant has been in operation 17 years and is still giving good service. This long service is due in a measure to the ease with which any burned-out portion of the shell can be replaced by the

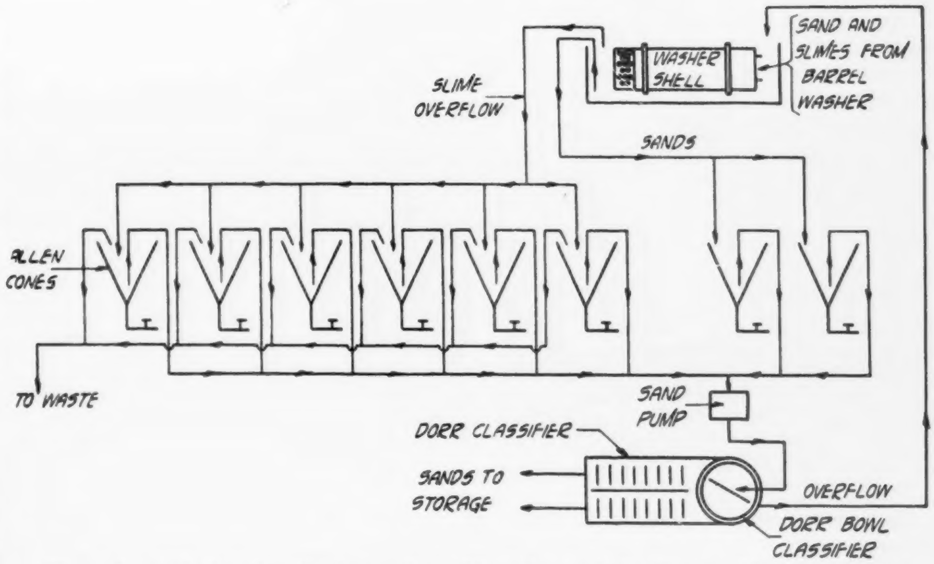
The area in the foreground has been stripped by the excavator which is shown loading the phosphate ore

use of an oxy-acetylene torch for welding. Two Brown type recording pyrometers are used on the discharge end of the dryers, as it is desirable to have the discharge product thoroughly dry. This has been found necessary to secure the fineness desired in the subsequent pulverizing operations.

The washing plant, pumps, dryers, Dorr classifiers, etc., are all driven by a 300-hp. steam engine from a line shaft that runs through the long axis of the plant. All the various units are controlled by suitable clutches.

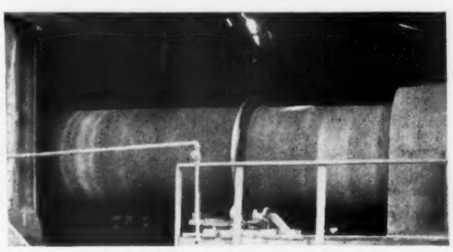
The dried material is received by a steel hopper that feeds a third inclined skip hoist, which delivers the sands to the long storage building, where the skip discharges to the bins below.

The dried product from this storage pile is reclaimed by a 24-in. belt conveyor that runs through a tunnel under the piles, and this



Flow sheet of the phosphatic sand washing plant of the Hoover-Mason company at Mt. Pleasant

belt can deliver either run-of-mill dried sands, pebble or pulverized phosphates direct to the Manierre car loaders, or it can deliver the rock to an ingenious shaking screen that is a development of Allen and Garcia.

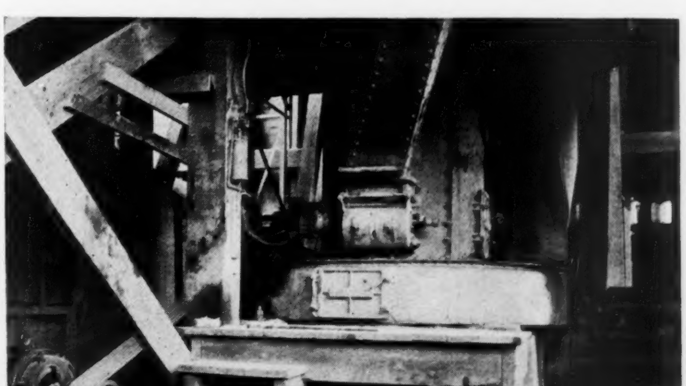


This dryer at the Hoover-Mason plant has been in operation for 17 years, a long record considering that it is not lined with refractories

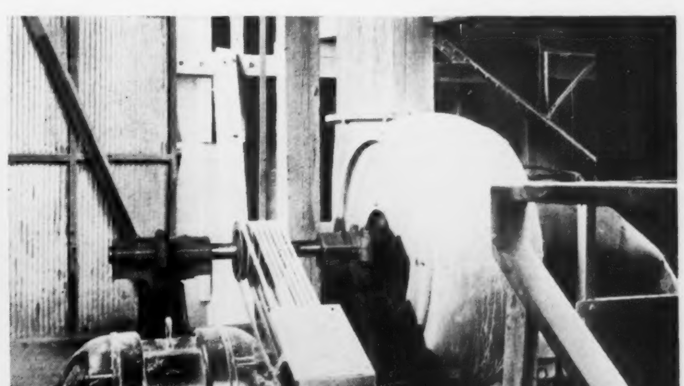
This piece of equipment is an inclined screen set at an angle of about 15 deg. from the horizontal, and is shaken by means of an eccentric at the end of the screen. The motion of the screen is such that the rock is conveyed at the same time, much on the same principle as the "skipulters" used in the cement industry. Here, however, the conveyor acts as a screen as well, and the oversize works forward and discharges to a bucket elevator that in turn discharges to a No. 2 Sturtevant crusher. The fines from this screen pass to a second bucket elevator and are elevated, along with the crusher discharge material, to bins that serve the two 5-roller, high side Raymond pulverizers.

The shaker screen is driven by a 5-hp. Westinghouse motor through a belt drive. The two elevators are driven by 5-hp. Westinghouse motors through enclosed gear reduction units at the head pulleys, the crusher by a 30-hp. General Electric motor through a Texrope drive, and the Raymond mills are each served by 75-hp. motors and Texrope drives. The Raymond mill fans are driven by 40-hp. motors with the same type of drives as the mills. The reclaiming belt and the direct current motor that serves the magnet which removes any tramp iron from the belt are driven by a 20-hp. Westinghouse motor.

The Raymond mills are equipped with spe-



The pulverizing unit at the Hoover-Mason plant which produces an exceptionally fine product

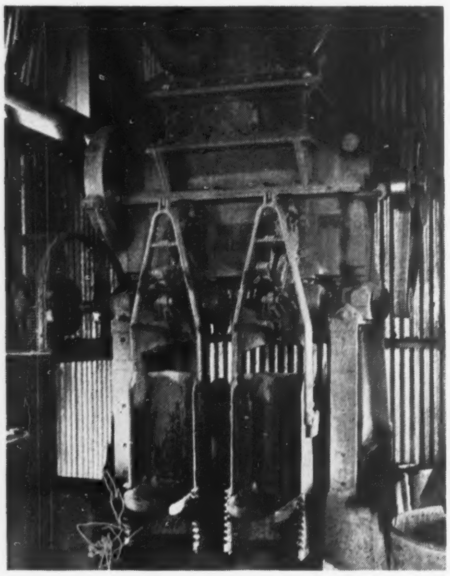


Fan used for air floating the phosphatic product at the Hoover-Mason plant

cial separators, another development of the engineers of this company, and it is claimed they get a finer ground product and a larger tonnage than would ordinarily be the case on this class of material. To facilitate the removal of the rolls an overhead monorail trolley serves each mill in conjunction with a 3-ton Chisholm and Moore chain block.

The pulverized material from the Raymond, cyclone, dust collector passes to a screw conveyor for loading direct to cars or

Side view of the new washing plant of the International Agricultural Corp.



Sacking equipment at the Hoover-Mason plant, the only plant in the district which ships a sacked product

by gravity to a storage pile alongside the storage allotted for the dryer discharge, and this finely ground material is reclaimed by the same belt conveyor previously described in connection with the reclaiming tunnel.

As the material from the mills is pulverized to a fineness of 99.5% through 100-mesh, and 82% to 85% through a 300-mesh screen (with openings 0.0018 in.), it is very difficult to hold, and consequently feeding the belt presents quite a problem in itself. For this purpose a swinging type cut-off gate is used.

The cyclone dust collector can discharge to the boot of a small elevator that delivers the product to an overhead screw conveyor which

Recording pyrometers with hot points in the dryer discharge at the Hoover-Mason plant

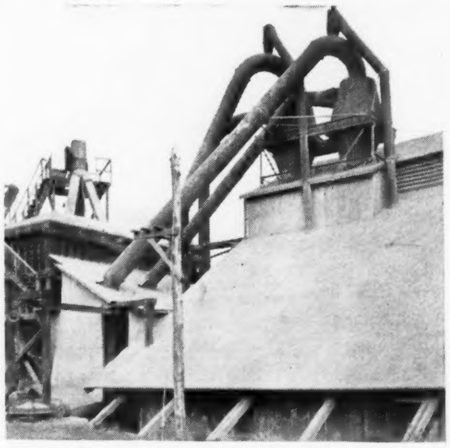
conveys the material across the railroad track to steel bins that serve the Bates packers. This elevator and conveyor are both driven by a 5-hp. Westinghouse motor at the head pulley of the elevator by enclosed gear reduction.

Sacking is done in paper or cloth sacks by a 2-tube Bates packer, after which the sacked material is loaded directly to cars. This sacked material is all for direct application to the soil, and is sold by the Ruhm Phosphate and Chemical Co., of Mt. Pleasant, Tenn., as Ruhm's "Lime Phosphate," a copyrighted trade name.

The plant of the Hoover-Mason Co. has a capacity of 300 tons of finished material per day, analyzing 74 to 76% B.P.L., and less than 4% iron and alumina, and to secure this tonnage, roughly, 600 tons of material must be mined, as they figure the ratio of crude to finished material as 2:1, and the rejects at this plant carry 21% to 35% B.P.L. The plant employs 40 men at the pits and 45 at the mill during normal operations.

The Hoover-Mason Co. is constantly aiming to improve its products and processes, and is at present carrying on extensive research along the lines of volatilizing the phosphorus content of the rock. This work is being carried on under the direction of Dr. L. Aronberg.

The operating offices are at the plant, and



Dust collection units at the Hoover-Mason plant, with the cyclone venting back to the storage bins

W. S. Mabee is superintendent; R. S. Morrison, assistant superintendent; J. S. Parker, plant foreman; E. B. Cole, field foreman, and J. C. Bayer, plant auditor. The principal office is at 2300 Willoughby Tower building, Chicago, Ill. The executive officers are: Frank K. Hoover, president; A. J. Mason, vice-president; Ray P. Hoover, vice-president, and H. Earl Hoover, secretary-treasurer.

New phosphate washer at the Blue Grass plant of the International Agricultural Corp.

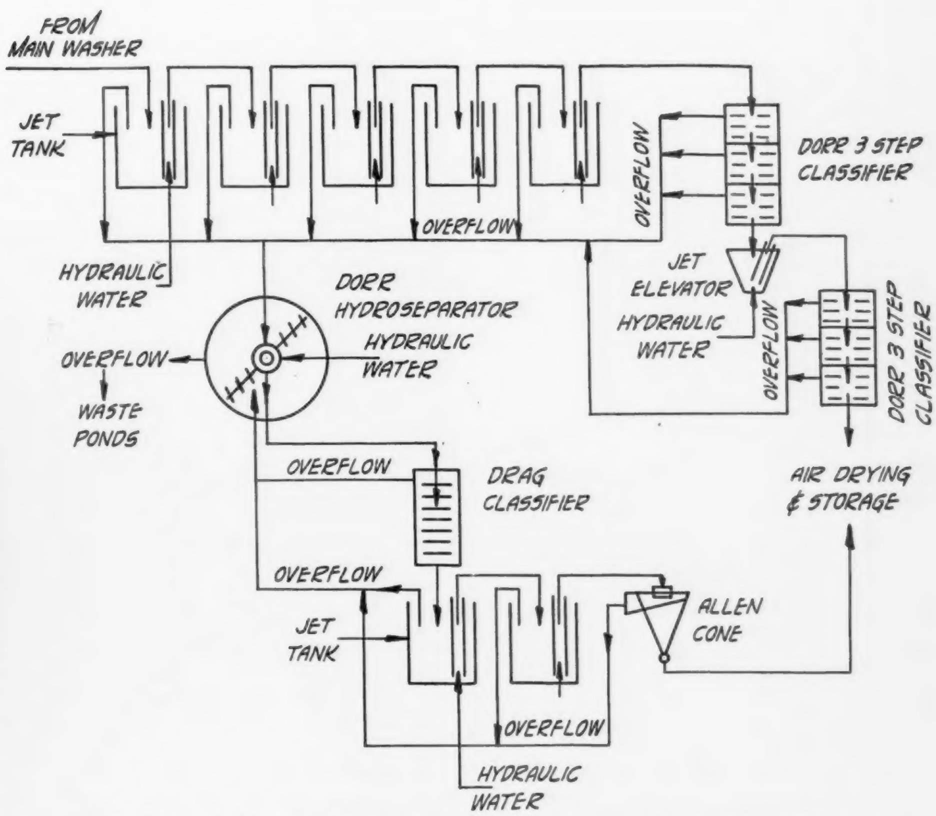
The International Agricultural Corp. Operation

The newest washer in the district is that of the International Agricultural Corp., re-

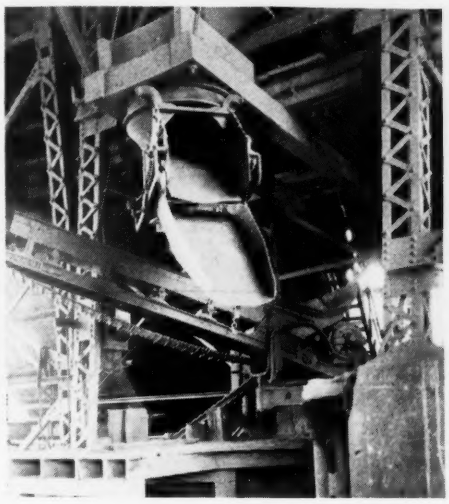
ferred to as the I. A. C. plant. The washing plant was completed in October, 1928, and was built alongside the old structure. This latter building is now torn down.

This washery has a capacity of 300 tons per day of recovered material, and can dry 225 tons in this same period. The company does no fine grinding at this plant, but conducts this operation at other locations.

The phosphate occurs in a blanket formation with a sand-clay overburden, which is removed by steam drag lines. The greater part of the phosphate is mined by drag lines,



Flow sheet of the washing plant of the International Agricultural Corp. at Mt. Pleasant, Tenn.



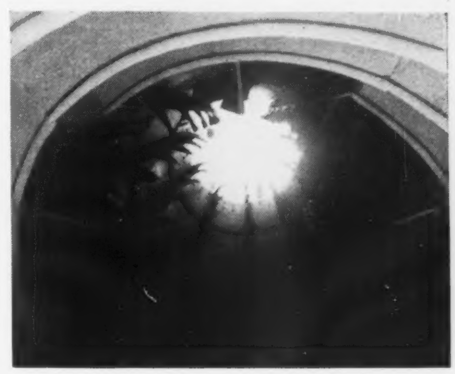
This car-loader at the International plant is typical for the whole Mt. Pleasant field

but in some pits where there are numerous limestone stools and "cutters" or crevices which cannot well be worked by drag lines, hand mining is used. To clean up odd corners of the property which do not justify extension of tracks and mining machinery the so-called "scrap mining" method is used where miners load into dump wagons drawn by mule teams. The wagons are emptied through a tipple into the regular tram cars.

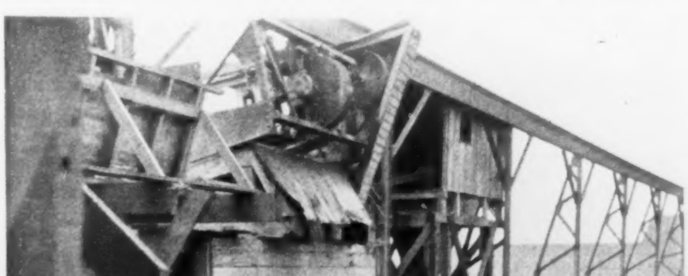
The washing plant was designed by the company under the direction of James A. Barr, chief engineer for the International Agricultural Corp., and is one of the simplest of any in that locality.

The end-dump cars, holding 4 yd., are brought to the foot of the incline by steam dinkies in trains of 30 cars, and are hoisted, one at a time, to the top of the incline by a single drum hoist that is belted to the main line shaft, which serves all the units in the rock washing plant. This line shaft is driven by a 150-hp. General Electric motor through a 24-in. belt.

The hoist sets behind a tilting dumping table at the head of the incline and pulls the car on to the table, which is so balanced that when the hoist operator is ready he can cause the tilting table to function, whereby the car and table tip forward sufficiently to



Looking through one of the dryers at the International operation, showing the type of lining and the tooth-like projections

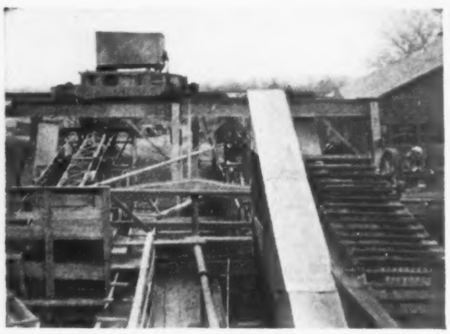


One of the two drag classifiers discharging to ground storage at the International plant

Jet washers, shown in the foreground, at the new International plant

let the material slide to the steel inclined apron below. The upper end of the tilting table has the two industrial rails bent upward so as to form a hook that effectively prevents the cars from becoming derailed during the dumping operation.

The sands as they come from the fields are mixed with considerable damp, sticky clay, and the material in the cars does not flow readily for that reason. To facilitate the removal of this muck, water is hosed on to the mass while the car is in the dumping position. The water is supplied from pumps that operate at 135-lb. hydrostatic pressure at the pump discharge. The nozzle is of the ball and socket type that are used in several



One of the regular classifiers at the left with the experimental drag classifier at the right

places in the field. The direction of water delivery from the nozzle is controlled by the hoist operator through a series of wire rope remote controls, and by their use he is able to direct the hose in any direction without having to leave the hoist platform.

The material falling to the steel apron is again hosed by a second operator by high pressure nozzles, and the partially disintegrated lumps fall through a short grizzly to the feed end of the first log washer. All the phosphatic material is forced through the grizzly and only stray lumps of limestone are discarded in the event they are of such size as to stay on as oversize.

There are two log washers operating in series, and each is 24 ft. long and operates at 20 r.p.m. The second log washer discharges to a 5x20-ft. rotary washing barrel provided with $\frac{3}{16}$x$\frac{3}{4}$-in. slots. The barrel trommel or screen washer is supplied with

Ground storage piles at the International plant, the newest in the Mt. Pleasant district

water from a horizontal pipe that extends into the machine at its center, and is delivered to the banked material through suitable nozzle outlets.

The oversize from the tumbling barrel falls to a short 36-in. sorting belt where any silica or clay balls are removed. By the men being careful at this belt the discharge product will have a B.P.L. content comparable with that of other producers in the field and with an alumina and iron content of 2.8% to 4%. The sorted material passes to ground storage below.

It will be noted that the plant has no ele-

Washing samples from areas being prospected for phosphates by the International Agricultural Corp.

vators and that the flow of material is such as to make a simple operation, and the products pass from unit to unit by gravity in each case. The washing plant is perhaps the simplest in the field.

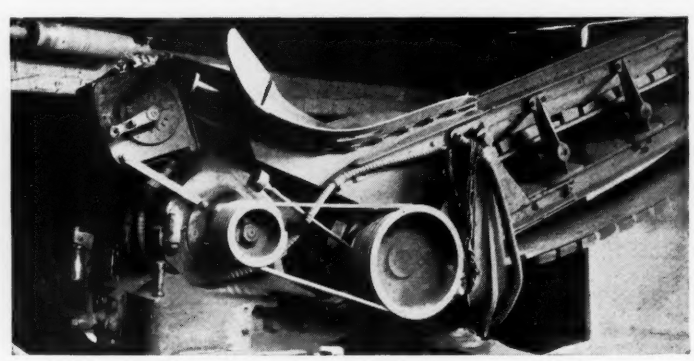
The fines from the washing barrel flow through an open launder provided with a grizzly screen, to remove any pieces of wood or foreign substances, to the head tank of a series of five decanting tanks operated in series. Each of these tanks are 10 ft. in diameter and 14 ft. high, flat-bottomed, and set practically at ground level. They operate somewhat on the same principle as the Allen cones previously described. The sands are jetted from the head tank to the next tank and on through the series by three jets in each tank.

The settled sands from the final or fifth tank are pumped to two Dorr classifiers operated in series, the transfer from the first Dorr to the second being by a jet elevator, and the washed sands from this unit discharge to storage below. The overflow from the Dorr classifiers joins the overflow from the five jet tanks and is received by a 50-ft. diameter Dorr hydro-separator or thickener.

The settled sands from the Dorr thickener are jetted to a drag classifier. The overflow from the Dorr thickener flows by gravity to the waste ponds. The overflow from the drag classifier goes back to the feed launder of the Dorr thickener.

The drag classifier discharges the heavier sands to two jet tanks and an Allen cone operated in series, but with the overflow from each unit meeting in a common header where they are returned to the Dorr thick-

Centrifugal pump direct-connected to a 300-hp. motor supplies water at 200 lb. pressure for International plant



One type of car loader used in the Mt. Pleasant district showing the method of driving

ener by gravity. The sands from the Allen cone fall to the air-drying and storage space along with the sands from the Dorr classifier.

The coarse material from the sorting belt and the washed sands from the Dorr classifiers are picked up by an overhead 10-ton Whiting electric crane and distributed to the proper pile for drainage of the excess water, after which the material is picked up by the same crane and conveyed to the bins ahead of the two rotary type dryers that receive the damp material from drum feeders. The dryers at this plant are fed at the cold end and will dry 135 to 165 tons from 20% moisture down to 2% to 3%. The dryers were purchased from Schofield and Sons, Macon, Ga.

The dried phosphate is elevated to a sizing screen and storage hopper by a single strand chain bucket elevator with buckets every fourth link. At this plant plain traction head pulleys are used, as sprockets with teeth handling the gritty material would cut down the lift of the chains 75%. Such an elevator will last three years in this service.

The phosphate is drawn directly from storage to an electrically driven larry similar to that used at the Charleston plant. This car delivers the material to storage piles, where, on standing, the residual heat reduces the water content to 1% or less.

The stored material is reclaimed by a belt conveyor operating through a tunnel under the storage piles. This conveyor delivers the phospatic material to a bucket elevator that serves a box-car loader.

The dryers, fan, feeders and discharge elevators are driven by a 75-hp. motor, and a 50-hp. motor serves the reclaiming tunnel belt and bucket elevators.

Water is supplied to the plant by a centrifugal pump direct connected to a 90-hp. motor at the creek which delivers water to a sump adjacent to the power house through an 8- and 10-in. line. Here the water flows to the suction well of a size No. 8 Cameron centrifugal pump which, operating at 1750 r.p.m., will deliver 2500 g.p.m. at 135 lb. per sq. in. hydrostatic pressure. This pump is direct-connected to a 300-hp. General Electric induction motor. Power is supplied this motor, as well as the balance of the plant motors, by the Southern Cities Power Co., which delivers the current to the plant at 440 volts, 3-phase and 60 cycles.

Prospecting and Plant Control

The extent, depth and quality of the phosphate deposits are usually determined by earth augers or post-hole diggers, and after preliminary work of this character has been done, test pits are sunk at frequent intervals throughout the areas and sufficient sands removed for washing tests. The tests consist simply of washing the sands in tubs somewhat on the same principle as that used by the placer gold miners.

The International Agricultural Corporation has other phosphate mining and washing operations in the Florida fields, and its production from that state is larger than the entire production of the Tennessee field.

The executive officers directly interested in the phosphate division are: J. J. Watson, president; J. T. Burrows, vice-president; O. L. Dortch, manager, and J. A. Barr, mining engineer. The operating heads of the Mt. Pleasant field are: H. O. Pickard, division superintendent; C. A. Irving, plant superintendent, and A. E. Clagett, superintendent of Wales district. The executive offices of the International Agricultural Corp. are at 61 Broadway, New York

The Reduction of Tricalcium Phosphate by Carbon

IN one of the recent issues of *Industrial and Engineering Chemistry*, K. D. Jacobs and D. S. Reynolds, of the U. S. Bureau of Chemistry and Soils, have published the results of their investigations on the reduction of tricalcium phosphate with carbon. The research work was in connection with the Fertilizer and Fixed Nitrogen Investigations.

In the volatilization process for the manufacture of phosphoric acid, the reduction of the $Ca_3(PO_4)_2$ is accomplished by heating with carbon in the presence of silica. The elemental phosphorus liberated is oxidized and finally recovered as orthophosphoric acid. The commercial value of the first reaction is that the SiO_2 reacts with the CaO to form a liquid slag which is tapped and removed from the furnace. In order to definitely establish the part the SiO_2 actually played in this process, it was necessary first to have a thorough understanding as to the reaction between tricalcium phosphate and carbon in the *absence* of silica. The results published cover this phase of the work only.

The first investigation involved the effect of carbon from different sources. The result showed that sugar carbon and carbon flour were slightly more effective as a reducing agent than lampblack or graphite; graphite less effective than amorphous carbons.

The effect of variation of the ratio of carbon to P_2O_5 gave results that showed, with a carbon ratio of 2,608, a reduction of 82.8%, and with a ratio of 0.457 a reduction of 99.8%. In other words, the lowest volatilization was obtained with the lesser carbon. Also, the effect of rate of preliminary heating showed that a larger percentage of the total phosphorus was volatilized when mixtures were heated rapidly to the desired temperature than when they were heated slowly. They account for this as being due to the formation of a more basic calcium phosphate that was more difficult to reduce at the slower preliminary heating, the quick heat resulting in the reduction of the $Ca_3(PO_4)_2$ before the formation of the basic phosphate.

The effect of thickness of the charge showed that the per cent. of volatilization decreased with increased thicknesses of the charge.

As nitrogen gas was passed through the reduction furnace during the experiments, a study was made to determine its effect. The effect of rate of flow probably would have been more pronounced if the gas had passed through the charge instead of merely over it.

Heating at various temperatures showed that reduction of tricalcium phosphate begins at about 1150 deg. C., but is slow below 1300 deg. C. Practically complete volatilization was obtained on 5 gm. of $Ca_3(PO_4)_2$ and 5 g. of carbon at 1325 deg. C. and 98.4% was reduced in 10 minutes at 1500 deg. C. Larger charges required a temperature of 1375 deg. C. for one hour for complete reduction. The effect of time showed that the reduction takes place in such a way that the velocity of reduction corresponds to that for a monomolecular reaction. They conceive of the reaction as taking place in two stages:

$$Ca_3(PO_4)_2 \longleftrightarrow 3CaO + P_2O_5$$
$$P_2O_5 + 5C = 5CO + P_2$$

Complete description of the pyro and analytical methods used are given, and the analytical results are in tabular and graphic form.

Quebec Asbestos Output Shows Big Gain

THE province of Quebec, largest asbestos producing territory in the world, valued its 1928 output at $11,238,361, according to figures issued by the mines department of the provincial government. This output represents an increase of a little over $750,000 over 1927.

During 1928, asbestos sold and shipped from Quebec mines amounted to 273,033 short tons, valued at $11,238,361. During the preceding year the figures were, respectively, 274,778 tons and $10,621,013, showing a decrease of 0.6% in tonnage but an increase of 5.8% in value. Average price a ton for all asbestos shipped during 1928 was $41.16 as against $38.65 in 1927.

Crude No. 1, the highest grade of asbestos mined in Quebec, brought an average value of $534.87 a ton. There were 893 tons produced during the year with a total value of $477,640, against a total value of $468,980 in 1927, when the output was 1107 tons, but the average price a ton was $423.65.

Crude No. 2 brought an average of $295.65 a ton in 1928, against $249.59 during the previous year. Crude run of mine came third, with an average value of $127.65 a ton in 1928, against $226.73 in 1927. Spinning fibre value was higher in 1928 than in 1927, averaging $148.71, against $129.32 in 1927. Shingle fiber also had a higher value, as did mill board and paper fillers, floats and other short fibres.

At the end of 1928 stocks of asbestos, all kinds, totaled 50,006 tons, valued at $1,879,257, against 56,812 tons, valued at $1,804,718, on December 31, 1927.

Geology of the Alpena, Mich., District

Some Interesting Data Concerning One of the Most Important Limestone Areas in the United States

By Henry H. Hindshaw
Geologist and Mining Engineer, Alpena, Mich.

IN the discussion of any subject it is necessary to have some classified knowledge of the data bearing on the subject for a foundation. Regarding rocks and rock products geology supplies the basis. Geology is not merely a science—it is the application of all scientific knowledge to the history of the earth. While geology is unlimited in its scope, the knowledge useful to a quarryman is simple and is mostly the application of common sense and observation with a general knowledge of the established facts.

Main Time Divisions Established

There are a few fundamental facts which are now well established and are easily available. Among these is a proper conception of time. The old idea of the time elapsed since the earth began to assume its present form, from a beginning, has lengthened out from 5,000 years to 5,000,000 years. The length of this period is demonstrated by all kinds of scientific evidence, and in recent years radio-activity has been important.

The main time divisions are well known and so are the general characteristics of the periods named. The rocks of the Alpena-Presque Isle district represent the whole time between the top of the Silurian and the base of the Carboniferous eras. The lower peninsula of Michigan is thickly covered with glacial drift. This is the only district in Michigan in which the stratified rocks are exposed over a large proportion of the earth's surface.

Several Formations Exposed

Nature has been even more favorable than this to the geologist, as the exposures present a cross section from some distance down in the Monroe formation of the Upper Silurian to the base of the Mississippian, approximately 1700 ft. of strata. This covers an immense lapse of time—according to modern geologists, 40,000,000 years. The end of this series, beginning of Mississippian, dates 120,000,000 years ago.

The rocks of this section are limestone and shale. Above the Monroe the limestones are almost wholly calcitic, dolomites occurring only in very thin beds of small extent, and magnesia seldom exceeds 10%; while in the Monroe, dolomite predominates, and in this northern region high calcite is only found in the Monroe in irregular coral reefs.

Shales are interstratified with the limestone; these are generally clays rather than laminated shales, and usually contain an abundance of fossils of animals living in shallow waters; brachiopods, corals, crinoids, the corals occasionally forming small reefs in the shale beds. There are no sandstones. The strata indicate a shallow ocean and low land. The fossils are more closely related to the Arctic ocean forms than to Atlantic species.

Deposition of Rocks

Deposition of rock-forming materials was not continuous. At the close of the Silurian time, after the laying down of the Monroe dolomite, there was a long period of dry land followed by an invasion of the ocean from the Arctic, coming in by way of Winnipeg, and also connected with the Atlantic. The land invaded was low and flat, as proved by the absence of any sands or river-carried materials.

The Dundee rocks began to be formed by the growth of coral reefs. At Rogers City and at Bell, the underlying Monroe is a soft brown dolomite resembling coarse brown sugar, very free from silica, etc. The coral reefs were formed in clear, warm ocean water, broken down by wave action and stratified as coral sand.

The underlying dolomite seems to have had some influence, as the lower 30 or 40 ft. of the Dundee contains 6% magnesia, while above this it drops to about 1%. A few thin films of dolomite, 1 or 2 in. thick, occur in this lower bed. The change from the lower to middle Dundee is indicated by the almost complete change of its fossil species. It seems probable that this marks the shutting off of Atlantic waters, especially as the same species of fossils are found through a much greater thickness of rock in southern Michigan.

Remnants of Organic Life Present

After this change very stable conditions prevailed for a great period of time; 100 to 120 ft. of coral sand, of almost chemically pure calcite, was deposited. There were interruptions enough to form bedding planes from 2 to 10 ft. apart, now showing a remnant of the organic life in the form of flakey dry bitumen, the remains of the oil contained in the Dundee of Michigan and Ontario, where it has not had the chance to escape along the exposed outcropping edges of the formation.

After the accumulation of 150 ft. of coral sand, dry land again appeared, followed by an invasion of a sea saturated with minerals in solution. It brought with it an entirely new series of animal life. The first deposits in the new formation were dolomites, and probably beds of gypsum and salt. This is shown by the dolomite being broken up and recemented into a breccia or conglomerate. A layer of dolomite, never more than 10 ft. in thickness and usually less than 5 ft., is the base of the Upper Dundee. It has been found over a distance of 20 miles or more. The new Upper Dundee ocean was clear and warm, with an abundance of life. The stone contains an average of over 97% lime carbonate; evenly bedded material was piled up over 100 ft. in thickness.

Erosion Period

On the raising of the land again there was a long period during which a great deal of limestone was removed by erosion. The entire thickness of the formation has been proved in many places by drill hole exploration. The dolomite bed at the base is easily recognizable, and the Bell shale on top accurately marks the thickness of the formation as it existed when the Bell shale was formed. This varies from 30 to 100 ft.

The dry land condition following the deposition of the Upper Dundee was of very long duration, as is proved by the eroded and irregular line of contact of the succeeding Bell shale.

The relation between our Alpena-Presque Isle time division and rocks of New York series has not been clearly worked out, but in a general way the Dundee is related in time with the Onondaga, and the Bell shale is supposed to be the equivalent of the Marcellus.

The Bell shale has a thickness of over 60 ft. at Bell (False Presque Isle) and 70 ft. at Rockport. It is a soft blue clay, full of fossil and coral masses. It is thinner where erosion has not removed so much of the Upper Dundee, and at one place is known to extend down to the Monroe. The weathered material of the Dundee land was gently washed into the sea as fine mud, with lime in solution. Coral reefs prevailed and in the clearer waters great reefs were formed. The black color and high bitumen content indicate deep beds accompanying the corals. There was little wave action, and the reef now being quarried at Rockport lies just as it grew; the vegetable contents color the stone black with its bituminous residue.

Limestone and Shale Series

The series of limestone and shale above the Dundee, about 800 ft. thick, is known as

the Traverse series. Its divisions are not well marked, and any of its members discontinue in short distances, shales or clay replacing limestone, and again coral reef growth preventing the accumulation of clay deposits. The Bell shale consistently forms the basal member of the series.

The pure black calcitic limestone of the Rockport reef changes to impure beds of gray limestone with a higher magnesia and silica content, and back to pure coral reef limestone again within 20 to 30 miles west of Rockport. Bending and distortion of the strata occurred and the Rockport reef shows a series of folds, the hollows filled with thin level beds of shale and limestone.

Geology of Long Lake Series Indefinite

This series above the Bell and under the Alpena has been called the Long Lake Series, but its geology has not been well described, and its limits defined. An extensive clay bed occurs which may be called the Long Lake shale. It is from 40 to 60 ft. or more thick, and in drill holes has frequently been mistaken for the Bell shale. Above this are shales and beds of impure limestones. These are generally very low in magnesia content but high in silica. The shales higher up in the series are harder than the Long Lake and Bell and contain scattered masses and small reefs of coral (Acervularia) which consist of almost pure lime carbonate.

The Alpena limestone lies irregularly on the Long Lake beds. It is a complicated series of shale, coral sand and coral reefs about 100 to 125 ft. thick, the shale contents diminishing towards the top. In the top 40 or 50 ft. there are areas of dolomitized rock of very irregular occurrence in the form of chimneys, sometimes 100 ft. or more in diameter. The Alpena limestone is exposed on the surface over many square miles of Alpena county, but it is unrecognizable or unidentified a few miles west of the city.

The top of the Alpena forms a natural division between the Upper and Middle Traverse. Thin beds of dolomite occur which seem to be of quite limited extent. The base of the upper Traverse is a clay of wide extent known as the Dock Street clay. It shows in many places in the bed of Thunder Bay river which follows the surface of the Alpena limestone. It is about 40 ft. thick, soft, plastic and from white to bluish gray in color. The upper Traverse, or Thunder Bay, beds are similar in character to the Long Lake Series. Some pure limestone occurs interstratified irregularly with clay shale. The series is 100 to 150 ft. thick. The upper member is a gray thin-bedded, very fossiliferous limestone on which rests the Antrim shale.

Character of Deposits

The oldest rock exposed in the district is the top of the Monroe formation at Rogers City. As there is no use made at present of anything below the Dundee limestone, little will be said of them. Between the bottom of the Dundee and the Niagara formation is a thickness of 2200 to 2300 ft. of rock, the upper 1100 ft. being considered as the Monroe and the lower 1175 ft. as Salina. The Monroe rocks are dolomites, cherts, some limestone with very little shale and no sandstone. Very little is known of them. The area in which they should come to the surface is nearly all covered with the waters of Lake Huron and Lake Michigan.

Salt Beds in the Monroe Formation

A number of salt beds are known to occur in the Monroe. These were found by drill holes at Alpena, but no record exists as to the nature and thickness of the salt. In Presque Isle county drilling showed the beds to have occupied the same position as at Alpena, about 400 ft. below the Dundee, but the salt had been dissolved, leaving residue of anhydrite. The Salina formation here shows one of the greatest rock salt deposits known. One drill hole shows 727 ft. of rock salt, 120 ft. of anhydrite, 117 ft. of dolomite and 150 ft. of shale. The extent of the bed is proved by two drill holes 30 miles apart and by the deep hole in Lake Huron, 750 ft. deep, due to the solution of the salt.

These resources will undoubtedly be made use of sometime. The anhydrite will probably be of more immediate interest as a source of cement retarder than the rock salt. Two attempts have been made to use this salt supply for soda ash manufacture, the Michigan Limestone and Chemical Co. being originally organized for this purpose. The other attempt was made by Frank B. Preston at Bell. The late Carl D. Bradley was much interested in the mining of rock salt.

Dundee Limestone Most Important

The Dundee limestone is so well known that it hardly needs discussion. It has been drilled over a distance of 30 miles along its outcrop, throughout which it shows a remarkable regularity. Over a hundred million tons of this formation have been shipped since 1913. The Upper Dundee varies considerably in thickness, as its surface was deeply eroded directly after its deposition. It is found to be from 30 to 100 ft. thick and have a chemical analysis (average of a number of drill holes records) of 96.79% $CaCO_3$ and 1.90% $MgCO_3$. The Middle Dundee averages 110 ft. in thickness with 97.12% $CaCO_3$ and 2.14% $MgCO_3$.

The Lower Dundee is 40 to 50 ft. thick with a little higher magnesium content. The thin bed of dolomite between the Upper and Middle division is not over 5 ft., but in the drill hole analysis it has been taken as 10 ft., so the result shows 76.26% $CaCO_3$ and 12.34% $MgCO_3$.

Little Stripping Necessary

Over a large proportion of the Dundee outcrop there is practically no cover and no stripping is necessary. At other places it may be necessary to remove some glacial drift, especially in a few pre-glacial, filled, channels. Some filled sink holes occur, into which has been washed material from the overlying Traverse Series or glacial drift.

At the easterly extension of the outcrop of the Dundee formation great quantities of broken Dundee limestone, terraces of gravel pushed up by the ice along the lake shore, cover wide areas extending back from the present shore line. The dip of the rock is to the south or a little west of south at about 40 ft. to the mile. Bell shale covers the inland side of the limestone outcrop. The shale is a soft plastic clay with high lime content. Owing to its soft nature, most of it has been washed away as far back as the escarpment of Traverse limestone. The bed of Grand Lake, 12 miles long, was formed in this manner. This 60 to 70 ft. of shale lying directly on the pure calcitic Dundee limestone, available over many miles, near the shore of Lake Huron, suggests unlimited possibilities in the line of cement manufacture.

Rocks of the Traverse Series

The underlying member of the Bell shale extends from Rockport more or less continuously to Rogers City. It covers a wide area at its southeastern end, at Rockport, reaches up to an elevation of 60 to 80 ft. above Lake Huron level; from two to four miles of Bell Grand Lake occupies its eroded outcrop. Its contact with the Dundee is usually hidden, but its soft character has formed the overlying limestone into a bold escarpment facing Lake Huron.

The only use to which the Bell shale has been put was in a small brick plant at Bell (after which locality it was named).

There was little demand for the brick, which proved of poor quality and quickly weathered to clay. There are not many analyses available, but two of them are as follows:

	Lime	Silica	Iron oxide	Al_2O_3	Mag.	Alkali
	Per cent					
Upper	13.44	54.56	2.48	9.32	3.31	3.06
Lower	12.16	54.32	2.57	11.22	2.98	4.21

The Rockport Limestone

The Rockport limestone forms a bluff facing Lake Huron, commencing at the south as low bluff, increasing in height westerly, running parallel to the Lake Huron shore as far as the Rogers-Maltka township line. At Rockport it is a black or black and white hard limestone about 40 ft. thick. In places it is covered by 20 or 30 ft. of a dense light bluff limestone of very good quality, this apparently originating as a lime mud. This formation was eroded in many places before the next formation filled the hollows with shale and thin limestone.

Within a few miles northwest the stone changes to a thin bedded impure black limestone, and west of Grand Lake this disappears under a series of grey coarse grained

coral reef formation with some very high grade stone, but for the most part it is high in both silica and magnesia.

Rockport was originally explored, as was Calcite, for marble. The black and white lower bed of the reef is coral breccia (Stromatopora) in which the black coloring matter has not penetrated the larger coral masses. It is available in any desired size of block. No tests have been made of its polishing or physical properties. Not much use has been found for the strata lying between the Rockport and Alpena limestone. The old Alpena Portland Cement Co. used the Long Lake shale to good advantage; this shale closely resembles the Bell shale, but is not as easily available.

A cement operation was started at El Cajon Bay where there is a bed of natural cement rock but of limited extent, but no cement was ever made there. There are some beds of dense black fossiliferous limestone resembling the Connemara marble, which might be made use of, however.

Alpena Limestone

While this is not a geological unit, the name has been used to include about 100 ft. of strata, coming to the surface north and west of the city of Alpena. It has been extensively tested by diamond drill and is quarried to its full depth by the Michigan Alkali Co. Its surface, exposed over a large area, is a series of coral reefs connected by coral sandstone. The upper bed, 25 to 30 ft. in thickness, has been described as the Alpena, while the beds below have been grouped with the Long Lake. The principal reason for this is that chimneys of dolomitized rock have their origin at this level.

Drilling, however, has shown that the strata are predominately calcite limestone to a depth of 80 to 120 ft. Thin seams of shale occur irregularly all through the formation, becoming thicker and more common in depth.

Thunder Bay Series

The upper Traverse has been called the Thunder Bay Series. It comes to the surface on the south side of the Thunder Bay river forming a belt three or four miles wide, mostly covered with glacial drift and sand dunes dipping under the Antrim shales. There is a large area exposed at the Potter farm adjoining the city limits on the west side. Its thickness is hard to determine, but seems to be about 150 ft. The basal member is a soft clay shale about 40 ft. thick, in two beds, distinguished by difference in color and fossil contents. The series consists of limestones and shales, replacing and succeeding each very irregularly; there are also a few thin dolomitic strata. Some very good calcite shows up on the Potter farm. To the west the series appears to become more consistently limestone. At Afton, 50 miles northwest of Alpena, no shale appears in the upper 100 ft. The upper bed is seen at Partridge Point, directly under the Antrim shale, and again at the Potter farm.

The shales or clays of the Thunder Bay Series closely resemble the Bell shale in character. No attempt has been made to use them except at the Warren brick yard in Alpena, but the clay deposit was too limited in extent to continue operations. Its place was taken by thin bedded crinoidal limestone on all sides.

Splendid Water Shipping Facilities in Alpena District

One great factor in the development of the Alpena district is its water shipping facilities. Alpena, splendidly located on Thunder Bay and sheltered in every direction from storms, has been an important lake port for many years. Rockport has its own port, well sheltered from storms. Bell harbor is a natural harbor cut into the Dundee limestone. An excellent harbor could be made at the outlet of Grand Lake, near Thompson harbor. Calcite, the harbor at Rogers City, is developed to take care of the shipping of over 10,000,000 tons of stone annually.

The district is at the geographic center of the Great Lakes navigation. Sailing distances from Rogers City in miles are: Alpena, 63; Bay City, 156; Detour, 31; Port Huron, 202; Duluth, 475; Soo Locks, 82; Chicago, 378; Gary, 390; Milwaukee, 313; Detroit, 263; Cleveland, 372; Buffalo, 525; Oswego, 536; Toronto, 567. A wonderful fleet of stone and cement carrying, self unloading, vessels has been developed to serve the three big quarries.

Development and Uses

The district now ships 15,000,000 tons of limestone and 3,000,000 bbl. of cement a year. A large proportion of the most readily available limestone (Dundee stone) is now owned by the Michigan Limestone and Chemical Co., Kelley Island Lime and Transport Co., The Solvay Process Co., Great Lakes Portland Cement Co. and Henry H. Hindshaw. Michigan Alkali Co., Diamond Alkali Co., Illinois Steel Co., Ford Motor Co., Aetna Portland Cement Co., Campbell Stone Co., Fred N. Potter and Kelley Island company own deposits of limestone (Traverse stone) at Alpena.

Early Quarries and Cement Mills

In 1903 a cement plant was built by the Alpena Portland Cement Co. with the intention to use marl from a lake nine miles north and clay from the same vicinity. Plant location was on bare limestone on Thunder Bay. The accessibility of the pure limestone made it preferable to use this material. Four 60 ft. by 6 ft. dia. kilns were installed and for a few years a quite successful operation, making a high grade cement, was carried on. About that time the Michigan Alkali Co. was in need of a large supply of limestone for the manufacture of soda ash at its Wyandotte plant. A quarry was opened near the cement plant and kiln stone shipped by rail to Wyandotte. The quantity to be carried soon exceeded the capacity of the D. and M. R. R., so a boat was built with a self unloading apparatus, the *Wyandotte*. A loading dock patterned after the ore loading docks on Lake Superior was constructed.

Huron Portland Cement Co.

For soda ash only clean, large size kiln stone is required. The efficient utilization of the small sized quarry stones called for a cement plant and the Huron Portland Cement Co. was organized and the plant built. The dry process was chosen so the comparatively dry slatey Antrim shale was preferable to the soft clays of the Traverse series, and a quarry opened about 10 miles west of Alpena. Steady growth of the demand on the quarry for more rock has brought the operations up to their present colossal size.

The quarry now has a face of 125 ft. Five steam shovels load the rock to cars operated by a Woodford centralized control system. The crushers, two large Fairmount single rolls, are located at the bottom of the first lift of the quarry. The crushed stone is elevated to the top of the screen house by skip hoist, and the two classes of products are carried by belt conveyors, one to the loading bins for shipment to Wyandotte and Ford City and the other to the cement plant.

A fleet of six boats is in operation. The *Wyandotte,* although not the first self-unloading vessel on the Great Lakes, was a pioneer in its design and equipment; it has been in continuous operation for 25 years. The *Alpena* and *Huron* were built at later periods. Thus it is apparent that the Huron company was among the first to ship portland cement by water in bulk. Cement made at its Alpena plant is shipped to bagging plants in Detroit, Duluth, Buffalo, Cleveland and Milwaukee. The Alpena mill has a capacity of 12,000 bbl. a day.

The Rockport Quarry

Rockport quarry is located on the Presque Isle-Alpena county line. The stone is used almost entirely for blast furnace flux and cement making. It has a capacity of 2,000,000 tons a year, and is owned and operated by the Kelley Island Lime and Transport Co. The present quarry face is about 30 ft. high and over a mile long; about 40 acres have been quarried. Steam shovels, quarry cars and locomotives are used. The crusher is a pair of Edison rolls with a capacity of 1000 tons an hour. Boat loading is from an ore-type dock, the stone going direct from the crusher and screen house to loading bins by chain bucket elevators and belt conveyors to dock or to a storage pile of the Calcite type.

Largest Quarry Operations in the World

Calcite is the name of the port at the Michigan Limestone and Chemical Co. plant at Rogers City. This is the largest limestone quarry in the world, with a capacity

of 12,500,000 tons in its 200-day season. Annual production is approximately 3,500,000 tons of fluxstone, 125,000 tons of agstone and 6,500,000 tons for chemical, cement and other uses. The quarry face is five miles long, from 50 to 125 ft. high. About 70 acres have been quarried, but in places only to one-half the depth of the limestone.

Steam shovels are being replaced by electrics of large size. The handling of from 50,000 to 60,000 tons in a 20-hour day requires large units all through. Full sized freight locomotives have succeeded the quarry dinkies, and the large air-dump cars are handled in trains. A continuous stream of cars are dumped into one of the two No. 60 gyratories, the other being kept ready to take its place. A belt conveyor carries the crushed stone to a screen house in which revolving grizzlies and vibrating screens size the stone into the 8 or 9 required sizes. The screening operations are wet, water being introduced at the different units.

Sized stone is carried by belt to storage piles and recovered by belts in tunnels underlying the piles. Belt conveyors take the stone to the loading docks where it is delivered to the boat over weightometers, by belts on bridges moving across the width of the boat, so as to trim as well as load. About 1000 cargos are loaded in a season, each of an average load of 10,000 gross tons.

The other active operation is that of the Campbell Stone Co., 50 miles northwest of Alpena, at Afton, Cheboygan county. This is included, as it is part of this field of Traverse rocks. The stone is the top of the Upper Traverse and dips to directly under the Antrim shale. The upper 31 ft. contains 97.36% and 70 ft. of 91.6% $CaCO_3$. The stone is used chiefly for sugar manufacture, the small and fine stone being calcined in rotary kilns. Agstone is also produced.

Illinois Plans Extensive Road Program

THE STATE of Illinois is prepared to undertake the most extensive three-year road construction program in its history, Gov. Louis L. Emmerson announced after the formal dismissal February 6 of 215 suits which have been pending in the circuit court attacking the validity of the 1929 3-cent gasoline tax law. Only two suits remain, and it has been announced that they will be dismissed shortly.

"Estimates vary, but it appears that the state will have between $26,000,000 and $30,000,000 to spend for new road construction this year. Before the end of March the highway department will begin a series of road lettings. Soon thereafter it will proceed with construction in all parts of the state," the governor said.

"By April the construction will be under way with the probability that 750 miles of new roadway on the state bond issue system will be completed by the end of the year, as well as a considerable mileage of county roads built under state supervision from the counties' share of the proceeds of the gas tax.

"This year Illinois will spend approximately $50,000,000 through its highway department. In addition to between $26,000,000 and $30,000,000 for new construction, nearly $9,000,000 will be used to square the state's obligations on uncompleted contracts and authorized work."

Quarry Accidents in 1927

A COMPREHENSIVE REVIEW of all the quarry accidents reported in the United States has been brought out as Bulletin 314 by the U. S. Bureau of Mines. Returns show an average of 91,517 men employed in quarries for that year with a total working time of 24,782,561 man hours.

A review of all of the accident reports for 1927 showed that 135 accidents resulted in the death of the injured employes, 7 disabled the employes totally and permanently, 358 caused permanent partial disability, 2414 caused disability which, while temporary, lasted more than 14 days and 10,680 caused disability for 1 to 14 days.

Considering quarry work only, as distinguished from crushing, rock dressing and other operations usually conducted outside the quarries, the operators' returns showed reduced fatality rates for quarries producing cement rock and for those producing granite and marble. Increased rates were shown for trap-rock quarries and for quarries that produced sandstone or bluestone. The rates for limestone quarries and for slate quarries showed no material change.

Kinetic Elutriation

KINETIC ELUTRIATION is a term given to a kind of classification which uses gravity and centrifugal force in combination. The material, such as sand, is pumped through what amounts to a screw conveyor in a vertical casing, so that it has to follow the flights of the screw as it rises. The centrifugal force set up separates the fine particles from the coarse, the fines going to the inside and the coarse to the outside. A simple cone at the top completes the separation by taking off the fines as an overflow.

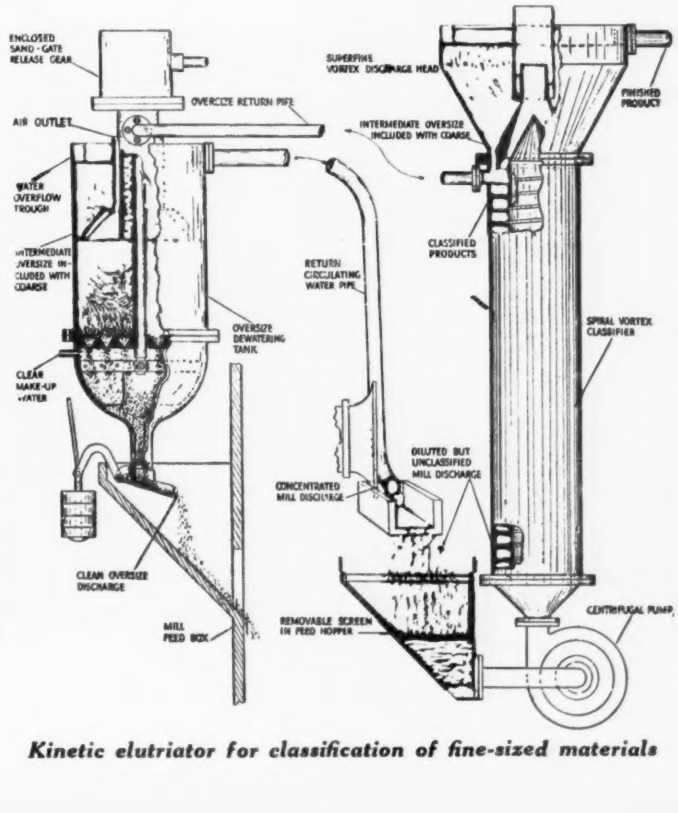
The advantage claimed is that the work is done at high speed so the dimensions may be kept small in comparison with the tonnage handled. Exceptionally good classifications is claimed to be possible, as an example given in the company's literature shows (see table).

In this case classification at 80-mesh is required.

The principle is one that is made use of in air separators and centrifuges.

The device is made by Kinetic Elutriators, Ltd., London. This company also makes a dewatering tank which is discharged by a novel method. The principle on which this depends may be illustrated by supposing a screw jack to be mounted on a ball bearing. Then if the screw was turned the jack would not lift because the base would turn with the screw. But if friction were to be applied to the base the jack would lift, because the screw and the base would move at different rates. In the machine the valve is moved by a rod which has paddles moving in a sand chamber. As soon as any sand collects the friction on the paddles brings a screw into play that lifts the valve rods.

		Original Feed	25% Fines	75% Oversize
	On 20 mesh	46.2%	....	60.3%
Through 20 mesh	On 50 mesh	21.8%	0.8%	28.3%
Through 50 mesh	On 80 mesh	6.0%	4.4%	6.7%
Through 80 mesh	On 120 mesh	6.7%	19.6%	3.3%
Through 120 mesh	On 200 mesh	5.2%	18.8%	1.4%
Through 200 mesh	On 0.04 mm.	4.0%	18.0%	....
Through 0.04 mm.	On 0.02 mm.	2.3%	8.9%	....
Through 0.02 mm.	On 0.01 mm.	2.0%	7.4%	....
Through 0.01 mm.	....	5.8%	22.1%	....
		100.0%	100.0%	100.0%



Kinetic elutriator for classification of fine-sized materials

Hints and Helps for Superintendents

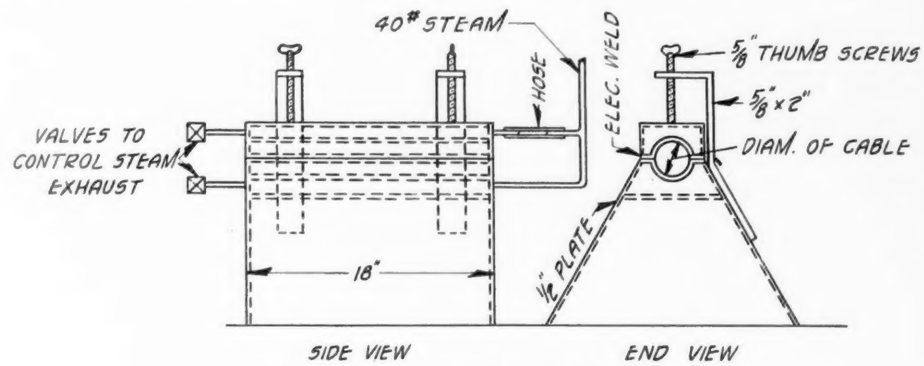
Repairing Rubber Cable

By NELSON SEVERINGHAUS
Superintendent, Consolidated Quarries Corp., Lithonia, Ga.

DUE to severe conditions of use, rubber cable supplying power to an electric quarry shovel frequently needs repair, if it is to give reasonable length of service. Rock cuts in the cover allow moisture to enter, eventually causing a short circuit between two wires and also making the cable difficult and dangerous to handle, due to current leakage to the outside. Such cuts can be temporarily repaired with friction tape, but this does not effectively exclude moisture and is very soon cut off in pulling the cable around on the quarry floor.

To solve this difficulty at the Rock Chapel, Ga., plant of Consolidated Quarries Corp., we have devised a vulcanizer to make permanent repairs. When wires are cut or burnt in two while the cable is in use, they are put together with a piece of split copper tube 4 in. long and about the same outside diameter as the wire. This tube is crimped tight on each end and then poured full of solder. The separate wires are then insulated with the usual rubber tape held on with friction tape.

At the earliest opportunity when the cable is not in use it is taken to the vulcanizer shown in the accompanying sketch. The field connections are cleaned up, bunched and wrapped with raw sheet vulcanizing rubber until a diameter about ⅛ in. larger than the original cable is reached. The rubber used is of the same grade used for vulcanizing automobile casings. Where raw rubber overlaps the original cover, some rubber cement is applied to make the repair stick. The cable is then placed in the vulcanizer, the top half of which is clamped down tight with thumb screws, and steam at 40 lb. pressure is applied for about 45 minutes. Steam is furnished by a 1½-hp. boiler. The resultant repair is entirely waterproof and has about the same wearing qualities as the original cable.



Details of a vulcanizer for rubber cable

The vulcanizer is made in our own shop of ½-in. sheet iron with the necessary joints electric welded.

Stripping on a Large Scale

THE November, 1929, issue of *Earth Mover* contains a description of the coal stripping operations of the Central Pennsylvania Quarry Stripping and Construction Co Rock products operators can learn something from these large scale stripping operations, particularly in the use of Western drop-door, air-dump cars of 10-yd. capacity on 36-in. gage track. The use of such a large capacity drop-door air-dump car on a narrow gage track is noteworthy and is said to be one of the first installations of its kind in any industry, according to the author, H. P. Henderson.

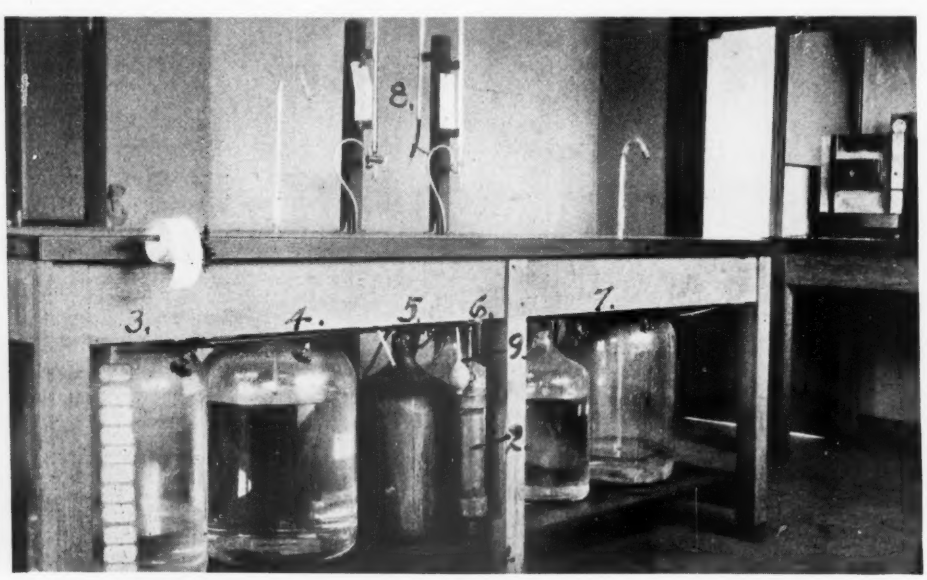
The cars are said to have given satisfaction at this operation.

Laboratory Titration Bench

By D. R. WILLIAMS
Chief Chemist, Monolith Portland Midwest Co., Laramie, Wyo.

THE titration bench illustrated herewith is being used successfully in the new chemical laboratory of the Monolith Portland Midwest Co. at Laramie, Wyo. It is placed in the center of the room opposite the main work bench. Each bottle is connected to the air line manifold and the solutions are forced into the burettes or gooseneck outlets by merely cracking the desired valve and closing the exhaust tube. This centralized arrangement provides more bench room. With reference to the cut, the numbers indicate:

1. Air line from plant compressor.
2. Air filter and drier.
3. Standardized acid.
4. Concentrated hydrochloric acid.
5. Standardized potassium permanganate.
6. Standardized potassium bichromate.
7. Distilled water.
8. Titrating burettes.
9. Aspirator bulb connected to air line manifold for emergency use when the air compressor is down.



More bench room is provided by this titration table arrangement

Glass Shield Protects Sacking Machine Operator

OPERATORS who have had experience with Bates packers know the distastefulness of having a bag, while filling, shoot off and the cement spurt out from the gun

Glass shield in front of packer protects the operator from cement dust spurts

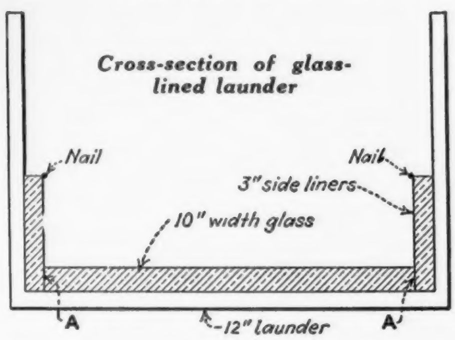
to hit the face and body. The sackers at the Concrete, Wash., plant of the Superior Portland Cement Co., to eliminate such possibilities, have rigged up a plate glass shield in front of the tubes in such a manner that it presents no obstacle or hindrance to the operator and yet affords ample protection. The illustration gives one an idea as to its construction.

Unusual Quarry Cars

OLD steam boilers, converted into quarry cars, are in use at several crushed stone operations in the South Atlantic states. These cars, mounted on a suitable chassis, hold from 2 to 3 yd. of stone. Typical of those in use are those shown herewith, at the plant of the Camp Concrete Rock Co., Camp, Fla. The small flanged wheel, resembling a car wheel, engages with an inclined side rail on arriving at the crusher and the continued pull of the load line elevates the rear end of the car and discharges its contents.

Glass for Launder Lining

GLASS liners for launders have been used in some of the mills of the Century Zinc Co., of Kansas, for three years, writes C. O. Anderson, metallurgist, in the *Engineering and Mining Journal* of recent date. All table and flotation plant launders are now thus equipped. No lining has been replaced so far. The coefficient of friction of glass is less than that of cast iron. Launder grade may therefore be less if glass is used, and head room saved. A saving is made in expense, also, the cost per foot for glass being about half that of cast iron. The launder lining used by the Century company, of hammered rough glass, is purchased from



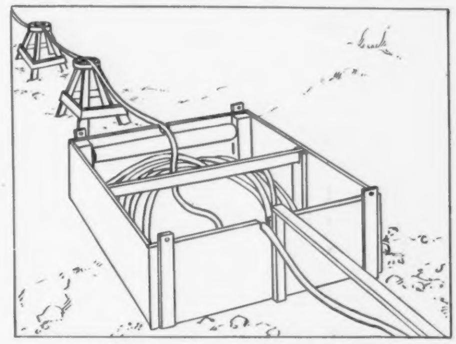
Cross-section of glass-lined launder

the H. M. Hooker Glass and Paint Co., of Chicago, and costs 25.2c. per sq. ft. plus 6.6c. freight, or a total of 31.8c. It is bought in 3-ft. lengths and in widths of 3, 4, 6, 8 and 10 in.

For example, a 12-in. spout is lined as follows (see sketch herewith): A 10-in. width is used and the bottom, and 3-in. widths, on edge, are used for the sides. The side liners are fastened with an occasional nail. Bottom and side liners are set in a thin slurry of quick-setting cement, compensating for a loose fit at *A*.

Protecting Electric Cable from Unnecessary Wear

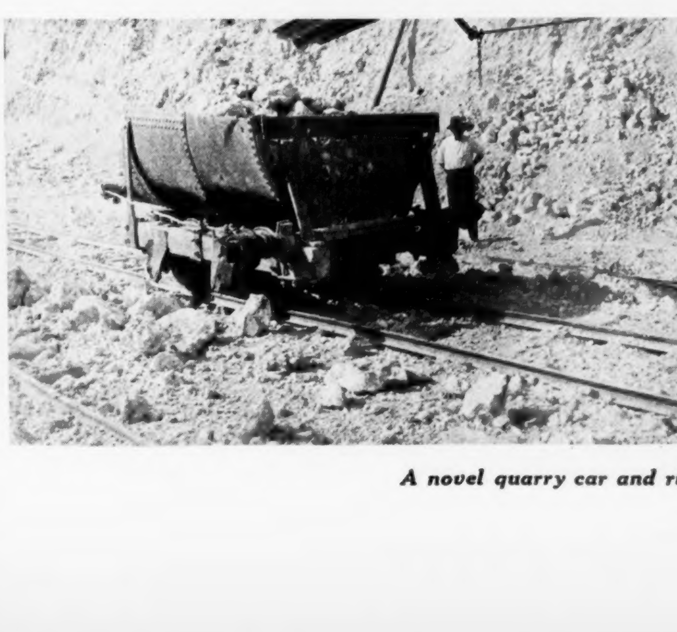
WHERE mobile quarry equipment such as shovels are operated electrically, high-power cable lines must be extended to the quarry and great care must be exercised that they do not become a dangerous hazard to the operators. The Universal Atlas Cement Co. provides regular daily inspection of the cables at its Northampton, Penn., limestone quarry, as a safety measure.



Skip carries surplus cable

The cable is kept off the ground as much as possible, by means of specially constructed standards, but when it must run under the track it is covered with a metal covering to protect it from hot cinders dropped by passing locomotives. A skip is drawn behind the shovel for all surplus cable. This surplus is laid in coils about 5 ft. dia. and pays out over a roller as the shovel advances. When moving back, a chain secured to the skip is hung over the dipper teeth, the skip drawn back and the cable coiled therein. This saves unnecessary wear of the rubber covering by dragging and the covered skip protects it from possible flying rocks during blasting.

The above has been taken from L. J. Boucher's paper, "Limestone Quarrying Methods at the Northampton Plant, Atlas Cement Co.," which was presented at the recent A. I. M. E. meeting in New York City. This paper is published in abstract elsewhere in this issue. Inasmuch as the ordinary way of handling cable is to have it unwind from reels, the above created considerable discussion at the meeting.



A novel quarry car and right, its dumping arrangement

Pennsylvania Stone Producers Will Do Active Promotion

THE PENNSYLVANIA Stone Producers Association held an interesting two-day session at Harrisburg, Penn., February 20-21. The subjects discussed included the present outlook for highway work in Pennsylvania; a proposed standard contract form; plant inspection of materials; the competitive situation, and the desirability of employing an all-time secretary, manager or engineer. It was voted at the meeting to proceed with the employment of an engineer or manager.

The state of Pennsylvania is planning the largest program of highway construction this year of any year in its history—about 1200 miles of paved road. It is proposed to require contractors to carry in stock at all times aggregates for one mile of construction, but who is to carry the financial burden for these stocks has not yet been satisfactorily settled. This stocking of aggregates at the site of the work is not looked upon very favorably by either the contractors or the producers, because of the financing and because of the liability of the stockpiles becoming contaminated with dust and dirt.

Inspection at the plant is not an unmixed blessing for the producers, because of the expense, and because there is a fear that in many instances the inspector will attempt to dictate the methods of plant operation. Also plant inspection will not insure against ultimate rejection of the material on the job, due to segregation or the accumulation of dust and dirt in transit and on the job. It was granted that there are instances where plant inspection might be desirable, but the producers were far from being unanimous for its universal adoption.

A committee was appointed which drew up a standard form of contract similar to that widely used by the portland cement manufacturers, which will be submitted to the member companies for adoption, and if acceptable will be adopted also by the sand, gravel and slag producers, through a joint committee, already provided for.

A. T. Goldbeck, director of engineering of the National Crushed Stone Association, was present and presented a thorough analysis of the method ordinarily employed to compute the quantities of aggregates in concrete design, in such a way that stone producers could understand and appreciate both the advantages and disadvantages of crushed stone. In the discussion which followed it was evident that political influence may be quite an important factor in the selection of aggregates for Pennsylvania highways.

F. T. Gucker, president, John T. Dyer Quarry Co., Philadelphia, Penn., presided as president of the association and P. B. Reinhold, P. B. Reinhold Co., Pittsburgh, Penn., as secretary. Several new members of the association were elected, and the prospects of an active association year in evidence.

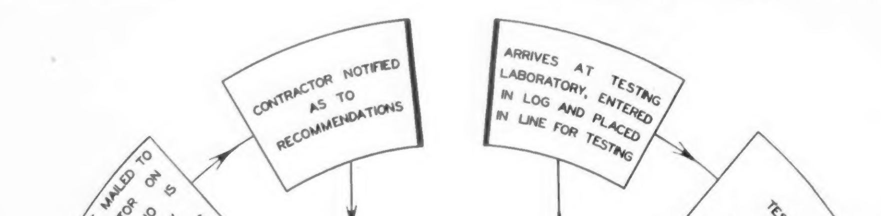


Diagram showing the "flow sheet" of materials used by the Pennsylvania State Highway Department between shipment of material and its final acceptance. This ought to be sufficient reason why inexperienced, irresponsible producers should stay out of the highway materials "game"

Idaho-American Phosphate Co. Buys Nampa Plant Site

PURCHASE of a factory site at Nampa, Idaho, for the erection of a $26,000 mill is announced by the Idaho-American Phosphate Co. The mill will be a two-story building, reinforced concrete, 60x100 ft., and will have 15,000 sq. ft. of floor space. Capacity of the plant will be about 100 tons of phosphate products daily.

The Idaho company operates extensive deposits of rock phosphate near Paris, Idaho, and will ship the crude to the Nampa mill for processing.—*Nampa* (Idaho) *Free Press.*

Alpha Portland to Build Jamesville, N. Y., Mill

ALPHA Portland Cement Co., Easton, Penn., is reported to be contemplating the erection of a new cement mill near Jamesville, N. Y., to cost over $500,000 with equipment.

Springhill Company to Produce Agricultural Limestone

SPRINGHILL PULVERIZED LIMESTONE CO. has been recently established near Point Marion, W. Va., by George Weightman and H. T. Fox of Uniontown, Penn. The new company will employ about 35 men, producing crushed limestone for agricultural purposes.—*Uniontown Genius.*

Beaver Portland Planning New Hydro-Electric Power Plant

BEAVER PORTLAND CEMENT CO., Portland, Ore., has plans for hydroelectric power house on Rogue river, near Gold Hill, Ore., for service at its cement mill in that district. Initial installation with transmission line wll cost about $300,000. F. W. Allen, Railway Exchange building, Portland, is engineer.

To Enlarge Plant

CENTRAL Kansas Quarries Co., Ottawa, Kas., is planning expansion of plant and facilities which will more than double the present capacity of 10 cars per day. The company, established in 1928, is operating at Rock Creek, 1½ miles from Ottawa, producing chiefly railroad ballast for the Missouri Pacific Railroad. In 1929, almost 100,000 tons of crushed stone were shipped. J. M. Kirk is plant manager.—*Ottawa* (Kan.) *Herald.*

Editorial Comment

When the Consumers Organize

Along with numerous other industrial and business magazines ROCK PRODUCTS is an earnest and sincere believer in trade and industrial associations, and freely uses its columns and its editorial pen to promote their organization and their activities. But like everyone else in industry we are apt to look at such organizations merely from the angle of the joiner, or the prospective joiner—their advantages to him and his business. We are accustomed to using phrases like "meeting the new competition in which one organized industry competes with another, rather than competition between producers in the same industry." But our visualization of such competition is generally of one commodity versus another, such as concrete (or cement) against brick; cement vs. asphalt, etc. What's going to happen when the consumers organize to dictate the selling policies of these same producers (and perhaps ultimately the prices)?

Of course there is nothing new or novel in the idea. Great corporations like the United States Steel Corp., the Ford Motor Co., etc., have long been accused of using their immense, concentrated buying power to reduce independent producers of basic commodities to industrial slavery. Also, associations of purchasing agents in certain industries have been accused of similar tactics to reduce the price of coal and other staples. We have had some startling international examples of the power of organized buyers, such as that which speedily broke the crude rubber market not so long ago. But all these have only faintly affected the average producer who sits secure in the belief that he is secure.

However, construction material producers are not secure. They are none too well organized to meet just such an onslaught on the part of organized consumers. The Associated General Contractors of America for example, have already announced in their official mouthpiece, *The Constructor,* that:

> It has become increasingly evident that something must be done to eliminate the unfair conditions now existing in regard to the preferential discounts given to public bodies, railroads and utilities. The unequal competition generated between contractors and day labor forces is becoming a menace which must be checked. Contractors are being seriously injured by the fact that the bodies receiving preferential prices are able to do more work than before with day labor, consequently reducing the operations of contractors who have to work under the unfair burden of the higher prices.
>
> Dealers and contractors are beginning to work together on the problem, for the dealers have been hard hit by the preferential system also. It is hoped that the two groups co-operating will develop mutual good will and create a strong force which will push the recognition of their rights.
>
> The Associated General Contractors and the National Association of Building Supply Dealers are working to bring this situation about and men from the national offices of both these associations are going to work together in ten localities during the coming year with the purpose of getting contractors and dealers together and eliminating the misunderstandings which have for so long a time kept the two groups from working together.

Sauce for the Goose, Etc.

This is no place to enter into the merits or the demerits of making a difference in price of material, such as cement and aggregates, to public-works authorities on the one hand and to contractors and dealers on the other. The practice is an old one and has at least some very good reasons for existence: When quotations are made to public authorities or railway companies in sealed bids and contracts are once entered into the producer is sure of his order, his price, and most of all, *payment* for his material. These things eliminate expensive sales effort, the possibility of curtailment of orders and the credit risk. They are money in the pockets of producers, as compared with unreliable promises in the other case.

It seems to us that the contractors have no moral, justifiable or even recognizable *rights* (to use their own term) until they have cleaned house and can insure producers that they are as good customers as public-works authorities or railway companies. They must cease to shop around among producers *after* they have received *bona fide* quotations from these producers, and they should accept quotations as *bona fide,* both for their own good as well as the producers'. They should make the same requirements of producers that they have set out to make of members of their own industry—that they be financially responsible and capable of fulfilling contracts entered into. They should cease trying to take unfair advantage of producers in numerous, devious ways now common practice, such as the cancellation of orders once entered into in good faith because of subsequent inducements offered by unscrupulous producers; they should cease to bait producers by threats to produce their own materials, etc.

Incidentally, these continual organizations of industries "to demand their rights" against other organizations is ample insurance that no industry can run wild and fix prices to suit itself, anti-trust laws or no anti-trust laws.

We Deal in Ideas

A CANADIAN friend recently handed the editor the following:

"You have a dollar. I have a dollar. We swap. Now you have my dollar—I have your dollar. We are no better off.

"You have an idea, I have an idea. We swap. Now you have two ideas and I have two ideas—both are richer.

"What you gave you have; what I got you did not lose.

"This is co-operation.—Points."

Since our business is dealing in ideas, we cannot recommend such co-operation too highly.—Editor.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	2.24-30	80	82	
Alpha P. C. new com.	2-21-30	29½	....	75c qu. Jan. 15
Alpha P. C. pfd.	2-21-30	110	....	1.75 qu. Mar. 15
American Aggregates com.[29]	2,24-30	19	23	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	2-25-30	85	90	
American Brick Co., sand-lime brick	2-24-30	....	12	25c qu. Feb. 1
American Brick Co. pfd., sand-lime brick	12-13-29	....	80	50c qu. Feb. 1
Am. L. & S. 1st 7's[29]†	2-24-30	95	97	
American Silica Corp. 6½'s[40]	2-25-30	No market		
Arundel Corp. new com.	2-24-30	42	42½	75c qu.Jan. 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	2-25-30	No market		
Atlas P. C. com.[2]	2-24-30	34	38	
Beaver P. C. 1st 7's[20]	1-10-30	....	100	
Bessemer L. & C. Class A[4]	2-21-30	31	32½	75c qu. Feb. 1
Bessemer L. & C. 1st 6½'s[4]	2-21-30	91½	95	
Bloomington Limestone 6's[29]	2-24-30	85	90	
Boston S. & G. new com.[47]	2-21-30	16	20	40c qu. Jan. 1
Boston S. G. new 7% pfd.[47]	2-21-30	46	50	87½c qu. Jan. 1
Calaveras Cement 7% pfd.	2-21-30	85¼	87	1.75 qu. Jan. 15
Calaveras Cement com.	2-21-30	....	14	
Canada Cem. com.	2-24-30	17½	18½	
Canada Cement pfd.	2-24-30	93½	94	1.62½ qu. Mar. 31
Canada Cem. 5½'s[43]	2-21-30	98¼	99	
Canada Cr. St. Corp. 1st 6½'s[43]	2-21-30	95¼	....	
Can. Gyp. & Alabastine (new)	2-24-30	24¾	....	37½c qu. Jan. 2
Certainteed Prod. com.	2-24-30	13½	14	
Certainteed Prod. pfd.	2-24-30	40	59½	1.75 qu. Jan. 1
Cleveland Quarries	2-24-30	67	70	75c qu, 25c ex Mar. 1
Columbia S. & G. pfd.	2-24-30	85	90	
Consol. Cement 1st 6½'s, A	2-25-30	85	95	
Consol. Cement 6½% notes[24]	2-25-30	80	90	
Consol. Cement. pfd.[29]	2-24-30	50	60	
Consol. Oka S. & G. 6½'s[12] (Canada)	2-21-30	99	101	
Consol. Rock Prod. com.[6]	2-20-30	2½	5	
Consol. Rock Prod. pfd.[6]	2-20-30	22½	25	
Consol. S. & G. com. (Can.)[38]	2- 8-30	No market		
Consol. S. & G. pfd. (Can.)	2-24-30	86½	....	1.75 qu. Feb. 15
Construction Mat. com.	2-24-30	20	21	
Construction Mat. pfd.	2-24-30	38	38¾	87½c qu. Feb. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	2-20-30	94	98	
Coosa P. C. 1st 6's[29]	2-24-30	50	60	
Coplay Cem. Mfg. 1st 6's[40]	2-20-30	90	....	
Coplay Cem. Mfg. com.[40]	2-20-30	10	....	
Coplay Cem. Mfg. pfd.[40]	2-20-30	70	....	
Dewey P. C. 6's (1942)	2-25-30	96	....	
Dewey P. C. 6's (1930)	2-25-30	96	....	
Dewey P. C. 6's (1931-41)	2-25-30	96	....	
Dolese & Shepard	2-24-30	82	86	$2 qu. & $1 ex. Jan. 2
Edison P. C. com.[39]	2-20-30	10c	....	
Edison P. C. pfd.[39]	2-20-30	25c	....	
Giant P. C. com.[2]	2-24-30	....	20	
Giant P. C. pfd.[2]	2-24-30	....	30	
Hermitage Cement com.[11]	2-17-30	25	30	
Hermitage Cement pfd.[11]	2-17-30	77	83	
Hermitage Cement 6's[11]	2-11-30	101	104	
Ideal Cement, new com.[33]	2-24-30	54	56	50c spec., 50c ex. Dec. 21&75c qu. Jan.1
Ideal Cement 5's, 1943[33]	2-24-30	95	98½	
Indiana Limestone com.[29]	2-24-30	No market		
Indiana Limestone pfd.[29]	2-24-30	No market		1¾% qu. Mar. 1
Indiana Limestone 6's	2-24-30	70	....	
International Cem. com.	2-24-30	58	59	$1 qu. Mar. 28
International Cem. bonds 5's	2-24-30	94½	....	Semi-ann. int.
Iron City S. & G. bonds 6's[46]	1-24-30	80	....	
Kelley Is. L. & T. new st'k	2-24-30	42½	43	62½c qu., 50c ex. Jan. 1
Ky. Cons. St. com. V. T. C.[48]	2-20-30	10	12	
Ky. Cons. Stone 6½'s[48]	2,-20-30	94	98	
Ky. Cons. Stone pfd.[48]	2-20-30	89	91	
Ky. Cons. Stone com.[48]	2-20-30	10	12	
Ky. Rock Asphalt com.[11]	2-17-30	16	20	
Ky. Rock Asphalt pfd.[11]	2-17-30	75	85	1.75 qu. Mar. 1
Ky. Rock Asphalt 6½'s[11]	2-17-30	96	100	
Lawrence P. C.	2-21-30	55	60	
Lawrence P. C. 5½'s, 1942	2- 5-30	84	90	

Stock	Date	Bid	Asked	Dividend
Lehigh P. C.	2-24-30	35	37	62½c qu. Feb. 1
Lehigh P. C. pfd.	2-24-30	106½	108	1¾% qu. Jan. 2
Louisville Cement[7]	2-21-30	230	....	
Lyman-Richey 1st 6's, 1932[13]	2-18-30	97	99	
Lyman-Richey 1st 6's, 1935[13]	2-18-30	97	99	
Marblehead Lime 6's[14]	2-21-30	94	98	
Marbelite Corp. com.	2-21-30	275	....	
Marbelite Corp. pfd.	2-21-30	11	....	
Material Service Corp.	2-24-30	22½	25	50c qu. Mar. 1
Medusa Portland Cem.[29]	2-24-30	100	115	1.50 Jan. 1
Mich. L. & C. com.[6]	2-10-30	30	....	
Missouri P. C.	2-24-30	34	34¼	50c qu. Feb. 1
Monolith Portland Midwest[9]	2-20-30	4½	5	
Monolith bonds, 6's[9]	1- 9-30	97½	100	
Monolith P. C. com.[9]	2-20-30	9	10	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	2-20-30	7½	8	40c s.-a. Jan. 1
Monolith P. C. units[9]	2-20-30	25	28	
National Cem. (Can.) 1st 7's[43]	2-21-30	99½	100½	
National Gypsum A com.	2-24-30	8	9	
National Gypsum pfd.	2-24-30	30	35	
Nazareth Cem. com.[26]	2-21-30	21	25	
Nazareth Cem. pfd.[26]	2-21-30	98	....	
Newaygo P. C. 1st 6½'s[29]	2-24-30	101½	103	
New Eng. Lime 1st 6's[14]	2-21-30	90	95	
N. Y. Trap Rock 1st 6's	2-21-30	95½	96	
N. Y. Trap Rock 7% pfd.[36]	2- 7-30	95	....	
North Amer. Cem. 1st 6½'s	2-21-30	55	56	
North Amer. Cem. com.[29]	2-24-30	3	4	
North Amer. Cem. 7% pfd.[29]	2-24-30	21	26	
North Amer. Cem. units[29]	2-24-30	24	29	
North Shore Mat. 1st 5's[15]	2-25-30	95	....	
Northwestern States P. C.[37]	2-21-30	135	145	$2 Jan. 1
Ohio River Sand com.	2-24-30	19	20	
Ohio River Sand 7% pfd.	2-24-30	98½	102	
Ohio River S. & G. 6's[16]	2-20-30	85	95	
Pacific Coast Cem. 6's[5]	2-20-30	80	85	
Pacific P. C. com.	2-21-30	26¼	28	
Pacific P.C., new pfd.	2-21-30	81½	95	1.62½ qu. Jan. 5
Pacific P. C. 6's[5]	2-20-30	99¼	....	
Peerless Cem. (new) com.[21]	2-21-30	9	11	
Peerless Cem. pfd.[21]	2-21-30	82	88	1.75 Dec. 31
Penn-Dixie Cem. pfd.	2-24-30	42½	43	
Penn-Dixie Cem.com.	2-24-30	7	7¼	
Penn-Dixie Cem. 6's	2-24-30	80½	....	
Penn. Glass Sand Corp. 6's	2- 5-30	100½	102	
Penn. Glass Sand pfd.	2- 5-30	100	....	1.75 qu. Jan. 1
Petoskey P. C.	2-24-30	8	8¾	15c qu. Dec. 31
Port Stockton Cem., units[9]	2-17-30	....	30	
Port Stockton Cem. com.[9]	2-17-30	....	4	
Riverside Cement com.	2-21-30	10	16	
Riverside Cement pfd.[9]	2-20-30	75	82	
Riverside Cement, A[9]	2-20-30	....	16	31¼c Feb. 1
Riverside Cement, B[9]	2-20-30	4	....	
Roquemore Gravel 6½'s[17]	2-10-30	99	100	
Santa Cruz P.C. 1st 6's, 1945	2-21-30	105¾	....	6% annually
Santa Cruz P. C. com.	2-21-30	92	....	$1 Jan. 1 & $2 ex.
Schumacher Wallboard com.	2-19-30	14⅛	....	
Schumacher Wallboard pfd.	2-21-30	23	24½	50c qu. Feb. 15
Southwestern P. C. units[14]	2-20-30	260	....	
Standard Paving & Mat. (Can.) com.	2-24-30	24	25½	50c qu. Feb. 15
Standard Pav. & Mat. pfd.	2-24-30	89½	....	1.75 qu. Feb. 15
Superior P. C., A	2-21-30	39¼	39¾	27½c mo. Mar. 1
Superior P. C., B	2-21-30	13½	15	
Trinity P. C. units[37]	2-21-30	127	135	
Trinity P. C. com.[37]	2-21-30	48	....	
Trinity P. C. pfd.[29]	2-24-30	103	110	
U. S. Gypsum com.	2-24-30	45¼	46	40c qu. Mar. 31
U. S. Gypsum pfd.[29]	2-24-30	116½	121	1.75qu. Mar. 31
Universal G. & L. com.[3]	2-25-30	75c	....	
Universal G. & L. pfd.[3]	2-25-30	8	10	
Universal G. & L., V.T.C.[3]	2-25-30	No market		
Universal G. &L. 1st 6's[3]	2-25-30	No market		
Warner Co. com.[16]	2-20-30	45	46	50c qu., 50c ex. Jan. 15
Warner Co. 1st 7% pfd.[16]	2-20-30	99	101	1¾% qu. Jan. 2
Warner Co. 1st 6's[8]‡	2-25-30	98½	99½	
Whitehall Cem. Mfg. com.[36]	2- 7-30	40	....	
Whitehall Cem. Mfg. pfd.[36]	2- 7-30	48	....	
Wisconsin L. & C. 1st 6's[15]	2-25-30	96	....	
Wolverine P. C. com.	2-24-30	5	5½	15c qu. Feb. 15
Yosemite P. C., A com.[9]	2-20-30	2¾	3¼	

†$40,189 called for redemption at 106, Feb. 26, 1930. ‡$105,000 called for redemption at 105, Feb. 25, 1930.

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler Beadling & Co., Youngstown, Ohio. [5]Freeman, Smith & Camp Co., San Francisco, Calif. [6]Frederic H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simons & Co., Inc., Detroit, Mich. [22]Hemphill, Noyes & Co., New York, N. Y. [24]A. B. Leach & Co., Inc., Chicago, Ill. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [28]Bank of Republic, Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago, Ill. [33]Boettcher Newton & o., Denver, Colo. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal, Quebec. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney, Williams & Co., Los Angeles, Calif. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Wise, Hobbs & Arnold, Boston. [48]E. W. Hays & Co., Louisville, Ky. [49]Blythe Witter & Co., Chicago, Ill.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
Atlantic Gypsum Products Co. 6's, 1941, $4,000 and 40 shs. com.[1]	35%	....
Atlantic Gypsum Products 6's, 1941, $5,000; 50 shs. com. as bonus[3]	49%	....
Consolidated Cem. com. v.t.c., 3220 shs.[1]	1½ per share	....
Indiana Limestone deb. 7's, 1936, wtih warrants ($1,000)[4]	$500 for the lot	....
Universal Gypsum com. trust ctfs., 800 shs.[2] (no par)	$5 for the lot	....
Universal Gypsum com., 300 shs.[2] (no par)	$6 for the lot	....

[1]Price at auction by Wise, Hobbs & Arnold, Boston, Dec. 18, 1929. [2]Price at auction by Adrian H. Muller & Son, New York, Dec. 18, 1929. [3]Price at auction by R. L. Day & Co., Boston, Dec. 18, 1929. [4]Price at auction by Adrian H. Muller & Son, Dec. 26, 1929.

Warner Company's Annual Report

IN THE annual report to the Warner Co. stockholders for the year 1929, reference is made to the formation of the new company (reincorporation of the Chas. Warner Co.), after which the purchase of the Van Sciver interests was made. The following, taken from the report, is of interest:

This consolidation brought together properties, equipment and other assets conservatively valued at over $20,000,000. The savings in duplication of effort between the two organizations in the various operations were estimated as amounting to over $700,000 per annum. The major part of these economies was effected within a few months following the time of merger, and the year 1930 starts in a very satisfactory operating condition, from the point of view of economy of production and transportation.

The experience acquired by the organization in various directions has developed several possibilities of effecting economies through moderate capital expenditures, and several of these improvements have been authorized by the board of directors during the past few months. Further, the very rapid growth of the central-mixed concrete business in the city of Philadelphia and suburbs necessitates additional mixing plants and special types of trucks. Further reference will be made to the central-mixed concrete development under separate heading.

For the above cited purposes the board of directors has appropriated during the past three months approximately $1,250,000 for capital outlays, practically all of which will add to company earnings. The funds for these outlays will come from surplus earnings and reserves already accumulated and from reserves and surplus earnings of 1930. Additional financing is not deemed necessary under existing conditions.

The operating statement for the fractional part of the year under the new Warner company management, as well as the balance sheet, is shown below. Due to the well known recession in business generally, and more particularly in construction lines, during the latter half of 1929, and due further to various delays in starting Philadelphia city and railroad construction work (both approved or generally decided upon in September, 1929), the company did not experience the usual fall seasonal advance in sales.

After experiencing this lull in business and absorbing the extra expenses incident to the consolidation, the earning statements show a return of $4.25 per share on the common stock after all charges, including federal tax reserves, for the period from April 8 to December 31. The company ended the year with the ratio of 3.75 to 1 in its quick assets to quick liabilities, which is more than adequate for a business of this kind.

An analysis of business conditions in the company's lines and in this territory indicates a steady improvement for some time. The local causes for hesitation have been largely cleared up so far as public work is concerned and the activities of the national and local conferences are combining to insure a gradual but steady improvement in the principal lines of business.

Central-Mixed Concrete

The company has successfully advanced central-mixed concrete practices in the Philadelphia area, and the new product under the engineering control practices which has been adopted and under the delivery methods employed in the use of special revolving drum trucks, has resulted in general approval by architects, engineers, contractors and city authorities. The progress has been so rapid that, compared with actual sales of approximately 200,000 cu. yd. in 1929, the

WARNER CO. (INCLUDING GEORGE A. SINN, INC.) CONSOLIDATED BALANCE SHEET, DEC. 31, 1929

ASSETS

Current assets:			
Cash			$623,106
Secured demand loans and short term notes			470,361
Accounts receivable		$1,049,751	
Notes receivable		150,439	
		$1,200,190	
Less reserve for doubtful accounts		28,999	1,171,190
Inventories (lower of cost or market			860,276
Total current assets			$3,124,935
Investments in controlled and other companies:			
Controlled:			
American Lime and Stone Co.*		$224,343	
Blue Diamond Co. of Philadelphia†		69,840	
Other		267,982	
Total investments			562,166
Fire insurance, workmen's compensation and sinking funds			157,589
Property, less depletion and depreciation:			
Land, mineral deposits, building, equipment, etc.		$23,057,631	
Less reserves:			
Depletion	$ 678,660		
Depreciation	5,494,451	6,173,112	
Property (net value)			16,884,519
Deferred charges:			
Prepaid insurance, licenses, etc.		$ 60,651	
Bond discount and expense (unamortized)		618,881	
Development, repairs and miscellaneous		131,393	
Total deferred charges			810,925
Total assets			$21,540,135

LIABILITIES

Current liabilities:			
Accounts payable			$159,860
Dividends payable			347,534
Accrued federal income tax			134,722
Accrued Pennsylvania bonus tax			30,000
Accrued interest and ground rents			115,462
Other accruals			45,014
Total current liabilities			$832,593
First mortgage 6% sinking fund bonds			6,684,000
Mortgage (Burlington Island)			45,000
Ground rents (principal)			365,000
Leasehold purchase contracts			580,000
Purchase money obligations:			
Arsenal mineral deposits ($121,500 payable semi-annually, June and December)		$729,000	
For capital stock (George A. Sinn, Inc.)		301,310	1,030,320
Reserves for fire insurance, workmen's compensation, and repairs			209,265
Capital stock:			
First preferred stock (31,123 shares)		$3,112,300	
Second preferred stock (57,500 shares)		5,750,000	
Common stock (no par) 204,727 shares paid in value	$2,074,771		
Acquired surplus	495,973		
Earned surplus	360,913	2,931,657	
Total capital			11,793,957
Total liabilities			$21,540,135

*Book value, 1321 shares pfd. stock......$179,656
6220 shares com. stock.... 417,117

Total......$596,773

†Book value—none.

ANALYSIS OF SURPLUS

(January 1, 1929, to December 31, 1929)

Allocation by board of directors as per pro forma balance sheet		$500,000
Provision for financing expenses per pro forma balance sheet, restored		50,000
Sundry items erroneously charged to surplus in pro forma		49,240
Land valuation erroneously excluded from appraisal		133,000
		$732,240
Less treasury stock formerly carried in employes' stock fund	$ 1,702	
Pennsylvania state bonus tax (estimated)	30,000	31,702
		$700,538
Legal expenses, organization expenses, etc., applicable to January 1, 1929	$23,553	
Net loss of predecessor companies, Jan. 1, 1929, to April 6	57,595	
Sundry adjustments made subsequent to April 6, 1929, applicable to period January 1 to April 6	34,828	
Inventory adjustments made subsequent to April 6, 1929, applicable to period prior to April 6	88,589	204,566
Surplus at date of acquisition, April 8, 1929 (adjusted)		$495,973
Net income April 8, 1929, to December 31, 1929, per consolidated statement of income and profit and loss		1,318,130
		$1,814,103
Dividends:		
First preferred	$157,978	
Second preferred	289,576	
Common	509,663	957,217
Surplus at date of acquistion, April 8, 1929	$495,973	
Earned surplus, December 31, 1929	360,913	
Total surplus December 31, 1929		$856,886

CONSOLIDATED STATEMENT

(Income and Profit and Loss)

(April 8 to December 31, 1929)

Gross sales		$10,110,916
Less: Costs	$6,663,415	
Depreciation and depletion	937,730	7,601,145
		$2,509,771
Wholesale sales expense	$282,958	
Administrative expense	227,434	
Provision for credit losses	62,971	
Discount allowed	145,143	718,507
Net profit		$1,791,264
Interest received from various sources	$11,372	
Discount earned	81,391	92,764
Gross income		$1,884,028
Bond and other interest paid	$366,913	
Amortization of bond discount and expense	32,942	399,855
Operating income		$1,484,173
Provision for federal income tax	$133,967	
Adjustments (net)	32,076	166,043
Net income		$1,318,130

NOTES: Warner company had an equity in the undistributed net income (before deducting losses from abandoned plant and other surplus charges) of American Lime and Stone Co. for the year ended December 31, 1929, amounting to $41,331.23; which is not reflected in the consolidated income reported above.

There was no net income attributable to the capital stock of the Blue Diamond Co. of Philadelphia, the remaining unconsolidated subsidiary, for the same period.

company has had to provide for a minimum demand of 500,000 cu. yd. in 1930. This requires the mixing and special trucking of approximately 1,000,000 tons of material in the finished concrete form, which, as compared with the older practice of delivering sand, gravel and cement separately, assures to the contractor customer lower costs and better product.

Bonus System

It has been Warner policy for years to apply a general bonus system payable to those principal employes upon whom rest the executive and managerial responsibilities of the company's operations. The board of directors has authorized for the year 1930 the payment to the bonus fund of an amount equal to 25% of all profits from operating sources in excess of $6 per share on the common stock. The bonus payment will be made in common stock of the company, to be purchased in the market from cash reserves as they accumulate in the bonus fund on the basis above cited.

American Lime and Stone Co.

The American Lime and Stone Co. is the most important operating subsidiary controlled by Warner company and is under direct Warner management. Its main plants are located in central Pennsylvania at Bellefonte and near Tyrone. Its principal business is the manufacture of pure high calcium chemical lime products used in over 100 of the chemical industries in the United States. This company is continuing to improve, showing net income for the year 1929 (before deducting losses from abandoned plant and other surplus charges) approximating $100,000. This is the best year experienced by this company, and for the purpose of maintaining the high quality of products and to insure further satisfactory growth, the management is continuing the policy of plowing back practically all of the profits into the business.

U. S. Gypsum Company Earnings in 1929

CONTINUED unsatisfactory conditions in the building trades has reflected in a further downward trend in the earnings of the United States Gypsum Co. in 1929, it was revealed at the annual meeting of stockholders recently, at which time share owners approved an increase in the authorized common stock to 3,000,000 shares of $20 par from 1,250,000 shares.

The consolidated net income in 1929 after depreciation, depletion, taxes and all other charges was $5,102,305, equal after preferred dividends to $3.98 a share on 1,149,290 shares of common stock outstanding. This compares with a net income of $6,031,635, or $7.22 on 760,436 common shares, in 1928. The 1929 net is the lowest reported since 1923.

After the payment of cash dividends there was a surplus of $3,198,190 in 1929 as compared with $4,328,434 in the previous year. The profit and loss surplus at the close of last year was $30,684,764, in comparison with $27,193,274 the year before.

The consolidated balance sheet of the company as of December 31 shows the maintenance of a strong financial position, with current assets of $14,284,956 and current liabilities of $1,734,446, as compared with $16,276,738 and $2,957,160, respectively, the year before.

Inventories Up $1,000,000

Inventories increased by nearly $1,000,000, while cash and government securities were off more than $2,800,000. Receivables were $1,200,000 lower. The decline in current liabilities was due to a drop of nearly $500,000 in accounts payable and more than $725,000 in accruals.

Commenting on the operations in the last year and the prospects for 1930, Sewell L. Avery, president of the company, in his letter to stockholders, stated:

"Expenditures for new plants, additions and improvements amounted to $11,254,534, which includes the construction started in 1928 of the new plants at Boston, Philadelphia, Detroit, Alabaster and Chicago. The partial financing of these new plants through the issuance of rights to the stockholders yielded $5,654,306 from the year's installments, the balance being provided out of earnings. These new mills were completed and put into production too late in the year to permit them to make a substantial contribution to earnings. The results already attained from their operation demonstrate the soundness, security and advantage of these investments.

Patent Troubles Over

"For many years the company has suffered from a general infringement of its wallboard patents and has incurred the expense of litigation in their defense. During the year these conditions have been corrected by arrangements for the payment to us of damages suffered and through the granting of licenses under royalty.

"The returns to be received, while substantial, are relatively of a minor amount. The major benefits anticipated are a relief from the disadvantages of and incident to legal contention, and the increased consumption of wallboard products which should follow the quality improvements that a full and uniform use of the patented methods and products should assure.

Feel Building Decline

"The benefits expected from an improvement in market conditions occurring in the middle of the year were offset by a drastic decline in building which was first felt in August. While improvement is confidently expected, it is obvious that in the cities, in divisions important to our business, building has exceeded the present demand.

"Disclaiming ability to foretell the next year's developments at this time, it may be fairly stated that the general feeling of the organization is that we shall have in 1930 a satisfactory and better year."

Present directors and officers were reelected.

Comparisons of consolidated income accounts and balance sheets are as below.

CONSOLIDATED INCOME ACCOUNT

Years ended December 31:	1929	1928	1927	1926
Net earnings	$ 7,415,619	$ 8,325,322	$ 9,961,466	$10,763,219
Depreciation and depletion	1,766,082	1,517,082	1,307,998	1,063,380
Federal taxes	547,232	776,605	1,114,960	1,324,092
Net income	5,102,305	6,031,635	7,538,508	8,375,747
Preferred dividends	528,090	541,503	554,552	567,563
Common dividends	1,376,025	1,161,698	1,793,545	6,116,089
Common dividends (stock)	....	1,383,004	....	....
Surplus for year	3,198,190	2,945,430	5,190,411	1,692,095
Paid on capital stock	293,300	14,625	237,826	322,915
Previous surplus	27,193,274	24,233,219	18,804,982	16,789,971
Profit and loss surplus	$30,684,764	$27,193,274	$24,233,219	$18,804,982
*Earned on common	$3.98	$7.22	$10.10	$11.35

*On 1,149,290 shares in 1929; 760,436 shares in 1928; 691,198 shares in 1927; 687,875 shares in 1926.

CONSOLIDATED BALANCE SHEET

ASSETS

As of December 31:	1929	1928	1927	1926
Plants and property	$47,639,427	$38,491,702	$34,008,606	$29,332,434
Stock subscriptions	1,393,978	6,411,395	....	....
Investments	209,646	196,698	160,033	127,814
Deferred charges	856,675	750,571	639,367	463,956
Cash	715,193	1,491,516	1,333,346	1,123,704
Receivables	4,084,987	4,203,138	4,757,525	5,286,831
Government securities	5,433,219	7,497,096	6,100,350	5,647,006
Inventories	4,051,557	3,084,988	3,431,907	3,754,123
Total current assets	$14,284,956	$16,276,738	$15,623,128	$15,811,664
Total assets	$64,384,682	$62,127,104	$50,431,134	$45,735,368

LIABILITIES

	1929	1928	1927	1926
Preferred stock	$ 7,541,700	$ 7,841,700	$ 8,141,600	$ 8,441,600
Common stock	22,985,800	22,810,820	13,823,960	13,757,500
Reserve for retirements and contingencies	1,437,971	1,324,151	1,593,114	1,663,049
Surplus	30,684,765	27,193,274	24,233,219	18,804,982
Accounts payable	644,090	1,139,716	924,426	1,210,554
Accruals	1,090,356	1,817,444	1,714,815	1,858,183
Total current liabilities	$ 1,734,446	$ 2,957,160	$ 2,639,242	$ 3,063,737
Total liabilities	$64,384,682	$62,127,104	$50,431,134	$45,735,868

Material Service Corporation Earnings in 1929

DAVID HIMMELBLAU and Co., Chicago, Ill., certified public accountants, report the Material Service Corp.'s earnings, including all subsidiaries, for the year 1929 to be $417,993.52 net, after provision for interest, depreciation, depletion and federal taxes. The annual statement shows the corporation's net worth increased $687,000 over January 1, 1929.

The present net worth is $4,073,594.49; there being no funded debt and no preferred stock outstanding, this figure makes the asset value of common stock $32.59 per share, or an increase of $5.50 per share over January 1, 1929. The good will is carried at $1, same as last year. Some $167,000 is earned surplus over dividend of $2 per share—$250,000—paid during year.

Sales are $9,171,075.27; the charge off for depreciation and depletion, $118,000 as compared with $59,000 for 1928.

The president of the corporation reports that very little of the new Lockport plant's operations was reflected in 1929 earnings due to plant and boat not being completed. But he expects the corporation should get 100% benefit of these facilities, as well as of the new Ottawa plant and the new South Chicago dock, with advanced improvements and equipment for handling materials in 1930. All of these represent an investment of $1,300,000 and will effect considerable savings in 1930, it is anticipated.

The corporation added an additional service yard during 1929 at 33rd and Racine streets, Chicago.

Dolese and Shepard Co. Annual Report

THE following taken from the annual report of Col. O. P. Chamberlain, president, to stockholders of Dolese and Shepard Co., Chicago, is of interest:

Both production and sales of crushed stone by the company were less in 1929 than in 1928. This was due to the market being less active than in the previous year and the reduction of production and sales of crushed stone in 1929 below those of 1928 was general throughout this district. Stone sales of 1929 were 116,000 cu. yd., 13.5% less than 1928. Crushed stone production fell off 130,000 cu. yd., 15% as compared to 1928. Despite the reduction in production, cost of production per cubic yard was substantially the same as in 1928. An additional source of revenue besides the manufacturing and wholesaling of crushed stone is the Hawthorne disposal station, the net returns in 1929 from this source being $55,522.96, a trifle more than in 1928.

The company expended $53,000 for new equipment in 1929. This consisted of five new quarry cars, new vibrating stone screens and an apportioning stone bin to deliver measured quantities of stone to motor trucks.

The reserve which will be available for dividends when needed amounts to $216,253.48 and consists of high grade bonds with a minimum interest rate of 4%. During 1929 declared dividends amounting to $172,332 were paid to stockholders.

In his report, President Chamberlain made the following statement in regard to the affairs of the company:

"A thorough investigation of the board of directors during the year disclosed the fact that we were carrying an overhead in salary payrolls out of line with the volume of our net sales, so a reduction of force was made to remedy this condition.

"Dolese and Shepard Co. is only one of the thousands of concerns that have found themselves overburdened with excessive overhead expense, which they have been able to take care of during the past few years of business. Now, however, conditions have changed and it is imperative that all expenses be scrutinized with care and overhead expense reduced wherever possible."

The comparative balance sheet for 1929 and 1928 is given below:

DOLESE AND SHEPARD CO. BALANCE SHEET
(At December 31, 1929 and 1928)

ASSETS

	1929	1928
Current assets:		
Cash on hand and in bank	$125,838.10	$83,711.10
Marketable securities, at cost	216,253,48	207,182.68
Accounts receivable	40,988.66	48,849.92
Notes receivable	1,800.00	2,599.28
Mortgage note receivable	16,785.00	16,785.00
Interest receivable	3,537.08	3,735.86
Inventories	80,342.53	88,324.98
Prepaid expenses	4,915.78	3,821.01
Total current assets	$490,460.63	$455,009.83
Capital assets:		
Plant and equipment	$1,192,782.64	$1,162,638.37
Less depreciation reserve	685,039.82	640,663.17
Plant and equipment—net	$507,742.82	$521,975.20
Real estate	570,036.73	612,716.86
Total capital assets	$1,077,779.55	$1,134,692.06
	$1,568,240.18	$1,589,701.89

LIABILITIES

	1929	1928
Current liabilities:		
Accounts payable	$5,231.53	$22,121.83
Dividends payable	57,444.00	38,296.00
Local tax reserve (two years)	28,957.09	12,633.74
Income tax reserve	22,606.33	28,000.00
Total current liabilities	$114,238.95	$101,051.57
Net worth:		
Capital stock outstanding	$957,400.00	$957,400.00
Surplus, December 31	496,601.23	531,250.32
Net worth	$1,454,001.23	$1,488,650.32
	$1,568,240.18	$1,589,701.89

Standard Gypsum to Pay Preferred Dividends in Common

STANDARD Gypsum Co. of California, which was recently reincorporated under Nevada laws, has been authorized by the California corporation department to distribute 21,908 common shares of the Nevada company to preferred stockholders of the California company in payment of accrued dividends on preferred stock. It is also authorized to transfer 63,247½ shares of common stock of the Nevada company to preferred stockholders of the California company and 46,123 common shares of the Nevada company to common stockholders of the California company. Stock of the Nevada company has a reported value of $2,776,565.—*Wall Street Journal.*

Trinity Portland Cement's Annual Statement

THE ANNUAL REPORT of W. H. L. McCourtie, president of the Trinity Portland Cement Co., Dallas, Tex., gives the following information of general interest: The volume of business done was somewhat greater than the preceding year. Because of a price decline dating back to September 1, 1928, profits were slightly less than in 1928; only increased efficiency of plants and operation account for profits at present low prices. A substantial volume of the company's business is unprofitable because of its inability to cope with the competition in price of imported cement. No further expansion of the company's operations is contemplated other than necessary maintenance. Notwithstanding an unprecedented spell of bad weather which has reduced the present volume of shipments by comparison so far this year, advance bookings and business conditions generally in trade territory justify the opinion that the year just beginning will develop reasonably satisfactory both as to volume and profits.

CONDENSED BALANCE SHEET OF THE TRINITY PORTLAND CEMENT CO., DECEMBER 31, 1929

ASSETS

Current assets and investments		$ 805,771.61
Inventories		986,886.87
Prepaid expenses		17,157.56
Plant property and equipment	$8,822,041.83	
Less depreciation and depletion	1,830,414.48	6,991,627.35
		$8,801,443.39

LIABILITIES

Capital stock		$3,500,000.00
Deferred liabilities:		
Bonds	$1,000,000.00	
Notes	250,000.00	1,250,000.00
Surplus		3,577,265.99
Current notes and accounts		456,901.85
Other current liabilities		17,275.55
		$8,801,443.39

Recent Dividends Announced

Alpha P. C. pfd. (qu.)	$1.75	Mar. 15
American Aggregates com. (qu.)	.75	Mar. 1
Canada Cement pfd. (qu.)	1.62½	Mar. 31
Cleveland Quarries (qu.)	.75	Mar. 1
Cleveland Quarries extra	.25	Mar. 1
Indiana Limestone pfd. (qu.)	1.75	Mar. 1
International Cement (qu.)	1.00	Mar. 28
Kentucky Rock Asphalt pfd. (qu.)	1.75	Mar. 1
Riverside Cement A	.31¼	Feb. 1
U. S. Gypsum com. (qu.)	.40	Mar. 31
U. S. Gypsum pfd. (qu.)	1.75	Mar. 31

Portland Cement Output in January

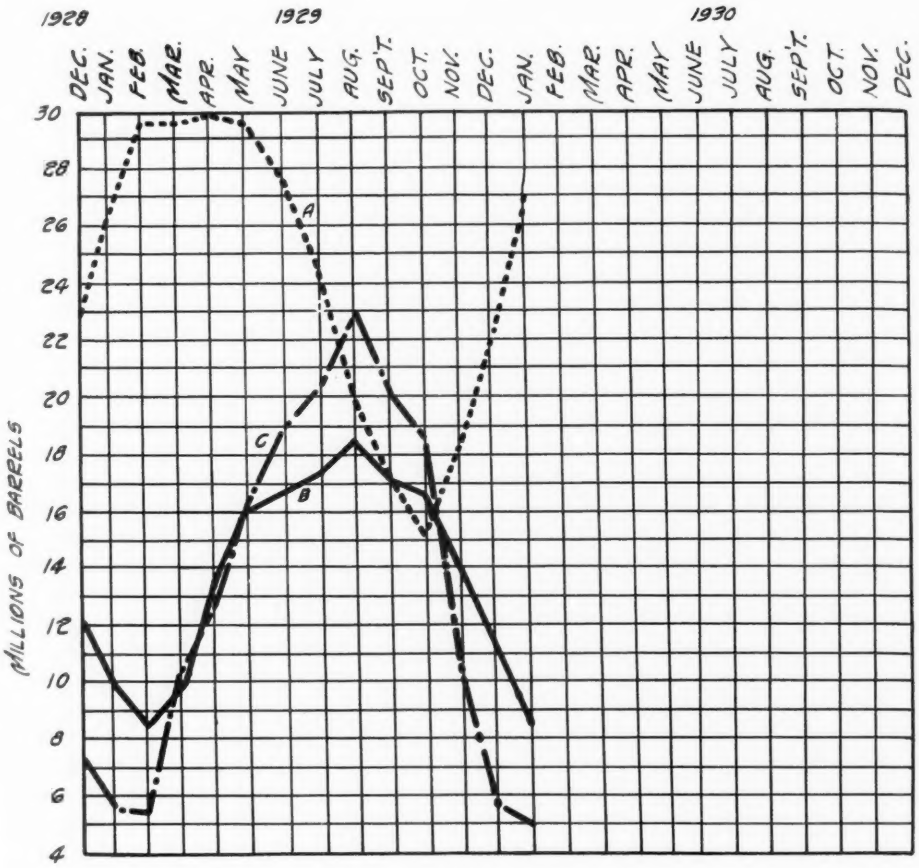
THE portland cement industry in January, 1930, produced 8,498,000 bbl., shipped 4,955,000 bbl. from the mills, and had in stock at the end of the month 27,094,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in January, 1930, showed a decrease of 14% and shipments a decrease of 13.2% as compared with January, 1929. Portland cement stocks at the mills were 1.1% higher than a year ago.

The statistics here presented are compiled from reports for January, from all manufacturing plants except two for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants at the close of January, 1930, and of 160 plants at the close of January, 1929. In addition to the capacity of the new plants which began operating during the twelve months ended January 31, 1930, the estimates include increased capacity due to extensions and improvements at old plants during the period.

RELATION OF PRODUCTION TO CAPACITY

	Jan. 1929 Pct.	Jan. 1930 Pct.	Dec. 1929 Pct.	Nov. 1929 Pct.	Oct. 1929 Pct.
The month	46.5	38.8	51.5	66.6	77.0
12 months ended	71.0	65.5	66.4	66.8	67.3



(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during November and December, 1928 and 1929:

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN NOVEMBER AND DECEMBER, 1928 AND 1929, IN BARRELS*

Shipped to—	1928—Nov.	—1929	1928—Dec.	—1929
Alabama	192,012	132,035	123,522	115,961
Alaska	264	396	132	962
Arizona	56,742	43,145	42,385	46,831
Arkansas	99,304	133,371	69,131	84,761
California	1,025,113	943,641	859,234	728,509
Colorado	52,084	32,910	24,317	32,359
Connecticut	161,388	178,005	97,419	62,419
Delaware	25,357	28,275	14,122	11,737
District of Columbia	88,507	99,047	53,681	44,485
Florida	117,845	111,127	97,857	84,792
Georgia	146,394	121,871	98,912	101,776
Hawaii	22,593	26,788	20,659	19,772
Idaho	17,765	17,468	5,533	6,642
Illinois	930,003	782,779	469,527	263,469
Indiana	258,523	326,534	133,155	108,261
Iowa	96,294	127,446	34,397	35,737
Kansas	167,928	159,803	93,623	105,763
Kentucky	146,416	107,310	63,567	46,660
Louisiana	104,808	152,054	74,396	171,845
Maine	30,175	52,865	11,944	19,014
Maryland	157,297	233,983	90,219	79,751
Massachusetts	224,846	225,482	136,456	101,340
Michigan	728,972	588,511	368,112	224,563
Minnesota	124,063	130,411	52,903	52,991
Mississippi	124,113	71,069	90,745	64,336
Missouri	364,782	396,019	193,691	142,398
Montana	25,857	16,035	11,889	8,041
Nebraska	67,962	61,548	32,472	33,088
Nevada	9,566	8,173	4,029	8,279
New Hampshire	37,083	37,526	19,477	13,915
New Jersey	690,435	678,291	383,075	281,867
New Mexico	21,301	15,557	15,068	10,437
New York	1,565,942	1,441,207	1,150,410	722,146
North Carolina	248,290	110,928	148,245	66,152
North Dakota	14,375	9,564	4,237	2,161
Ohio	707,863	638,120	351,927	253,060
Oklahoma	238,178	261,283	220,102	213,739
Oregon	65,960	78,363	39,466	49,698
Pennsylvania	958,080	1,022,410	539,402	435,580
Porto Rico	500	3,520	0	4,500
Rhode Island	61,403	58,690	43,188	24,096
South Carolina	135,037	70,756	92,059	67,813
South Dakota	17,271	22,438	6,722	12,744
Tennessee	257,552	228,476	138,090	136,191
Texas	447,090	475,332	379,921	428,688
Utah	29,404	37,616	15,132	23,560
Vermont	31,272	43,012	11,026	17,560
Virginia	148,508	120,589	97,175	68,406
Washington	243,351	158,675	132,183	101,062
West Virginia	94,931	103,156	46,917	50,471
Wisconsin	258,637	224,480	114,658	80,278
Wyoming	11,987	9,346	4,428	6,690
Unspecified	32,678	0	502	0
	11,884,101	11,157,436	7,321,439	5,877,356
Foreign countries	66,899	64,564	62,561	73,644
Total from cement plants	11,951,000	11,222,000	7,384,000	5,951,000

*Includes estimated distribution of shipments from three plants each month.

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1929 AND 1930, IN BARRELS

Month	1929—Production	—1930	Stock at end of month 1929	Stock at end of month 1930
January	12,012,000	10,504,000	9,642,000	9,646,000
February	11,255,000	....	12,436,000	....
March	12,450,000	....	14,948,000	....
April	14,166,000	....	15,479,000	....
May	15,444,000	....	14,911,000	....
June	15,312,000	....	13,587,000	....
July	15,214,000	....	11,619,000	....
August	15,829,000	....	8,995,000	....
September	15,165,000	....	7,009,000	....
October	15,515,000	....	5,934,000	....
November	14,087,000	....	6,134,000	....
December	12,539,000	....	7,526,000	....

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN JANUARY, 1929 AND 1930, AND STOCKS IN DECEMBER, 1929, IN BARRELS

District	Production 1929—Jan.	Production Jan.—1930	Shipments 1929—Jan.	Shipments Jan.—1930	Stocks at end of month 1929	Stocks at end of month 1930	Stocks at end of Dec. 1929*
Eastern Penn., N. J. and Md.	2,410,000	2,286,000	1,387,000	1,388,000	6,087,000	6,075,000	5,177,000
New York and Maine	405,000	320,000	257,000	249,000	1,804,000	1,626,000	1,555,000
Ohio, W'n Penn. and W. Va.	818,000	727,000	430,000	472,000	3,224,000	3,289,000	3,035,000
Michigan	703,000	346,000	266,000	234,000	2,435,000	2,516,000	2,403,000
Wis., Ill., Ind. and Ky.	1,047,000	1,377,000	313,000	327,000	3,423,000	3,926,000	2,876,000
Va., Tenn., Ala., Ga., Fla., La.	884,000	842,000	824,000	730,000	1,955,000	1,753,000	1,641,000
Eastern Mo., Ia., Minn., S. D.	1,198,000	758,000	189,000	214,000	3,891,000	3,140,000	2,595,000
Western Mo., Neb., Kans., Okla. and Ark.	614,000	701,000	349,000	271,000	1,610,000	1,886,000	1,456,000
Texas	466,000	321,000	458,000	317,000	530,000	817,000	813,000
Colo., Mont., Utah, Wyo., Ida.	50,000	....	61,000	42,000	524,000	413,000	456,000
California	1,034,000	718,000	1,033,000	640,000	785,000	1,168,000	1,090,000
Oregon and Washington	252,000	102,000	140,000	71,000	529,000	485,000	453,000
	9,881,000	8,498,000	5,707,000	4,955,000	26,797,000	27,094,000	23,550,000

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1929 AND 1930, IN BARRELS

Month	1929—Production	Production—1930	1929—Shipments	Shipments—1930	Stocks at end of month 1929	Stocks at end of month 1930
January	9,881,000	8,498,000	5,707,000	4,955,000	26,797,000	27,094,000
February	8,522,000	....	5,448,000	....	29,870,000	....
March	9,969,000	....	10,113,000	....	29,724,000	....
April	13,750,000	....	13,325,000	....	30,151,000	....
May	16,151,000	....	16,706,000	....	29,624,000	....
June	16,803,000	....	18,949,000	....	27,505,000	....
July	17,315,000	....	20,319,000	....	24,525,000	....
August	18,585,000	....	23,052,000	....	20,056,000	....
September	17,223,000	....	19,950,000	....	17,325,000	....
October	16,731,000	....	18,695,000	....	15,381,000	....
November	14,053,000	....	11,222,000	....	18,213,000	....
December	11,215,000	....	*5,951,000	....	23,550,000	....
	170,198,000	....	*169,437,000	....	....	....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN JANUARY, 1929 AND 1930, IN BARRELS

District	Production 1929	Production 1930	Stocks at end of month 1929	Stocks at end of month 1930
Eastern Pennsylvania, New Jersey and Maryland	2,824,000	2,546,000	1,344,000	1,356,000
New York and Maine	585,000	525,000	1,080,000	813,000
Ohio, Western Pennsylvania and West Virginia	1,121,000	999,000	1,189,000	1,212,000
Michigan	913,000	868,000	876,000	1,152,000
Wisconsin, Illinois, Indiana and Kentucky	1,617,000	1,586,000	1,002,000	858,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	1,076,000	901,000	995,000	732,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,276,000	790,000	566,000	575,000
West'n Missouri, Nebraska, Kansas, Oklahoma, Arkansas	715,000	805,000	530,000	290,000
Texas	456,000	400,000	145,000	563,000
Colorado, Montana, Utah, Wyoming and Idaho	101,000	11,000	395,000	254,000
California	1,053,000	926,000	1,219,000	1,315,000
Oregon and Washington	275,000	147,000	301,000	526,000
	12,012,000	10,504,000	9,642,000	9,646,000

Exports and Imports

(Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision)

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN DECEMBER, 1929

Exported to	Barrels	Value
Canada	1,744	$ 8,831
Central America	16,075	38,527
Cuba	5,573	12,386
Other West Indies and Bermuda	6,917	18,446
Mexico	24,686	65,870
South America	28.484	113,148
Other countries	4,924	40,047
	88,403	$297,255

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN DECEMBER, 1929

Imported from	District into which imported	Barrels	Value
Belgium	Los Angeles	43,816	$26.767
	Massachusetts	17,466	20,036
	Oregon	2,982	3,619
	San Antonio	9,612	9,993
	Porto Rico	500	667
	Washington	1,000	1,184
	Total	75,376	$62,266
France	Massachusetts	344	$1,090
Germany	Los Angeles	2,750	$4,749
	New York	13	36
	Total	2,763	$4,785
Italy	New York	1,180	$4,338
United K'gd'm	New York	3,187	$4,990
	Philadelphia	1,508	1,629
	Total	4,695	$6,619
	Grand total	84,358	$79,098

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN DECEMBER, 1929

	Barrels	Value
Alaska	517	$ 1,532
Hawaii	22.441	54.458
Porto Rico	6.495	13,131
	29,453	$69,121

Cement and Structural Steel

(An editorial in *Iron Age*)

TWO years ago we called attention to the fact that portland cement and fabricated structural steel had had substantially similar increases in 15 years, each approximately doubling in quantity, while both total steel production and freight movement on the railroads had increased less than 50% in the same period.

A remarkable swing has since occurred. Instead of cement holding level with structural steel, it declined last year, while structural steel had a large increase, the ratio of cement to steel losing about one-fifth.

Of course it did not require statistics of recent years to dispel the fear of some years ago that concrete would become a formidable competitor of structural steel and tend to displace it. Both are construction materials and they help each other rather than compete. There would be less disposition to erect large bridges and even some buildings if the very convenient concrete were not available.

Cement, moreover, has had the assistance of road building in recent years, involving a large consumption which has no counterpart in fabricated structural steel, for the comparison here being made is solely with fabricated structural steel as reported monthly by the structural fabricating shops to the Department of Commerce. There has been a large increase in road building over 15 or 20 years ago and in addition a reduction in the amount of macadam. Of course no little steel is used in road building, in addition to culvert and water-crossing needs.

For the precise comparison the number of barrels of portland cement per ton of fabricated structural steel is computed in the accompanying table. For fabricated structural steel the figures through 1923 are production of the shops, shipments being given for the later years.

STRUCTURAL STEEL AND CEMENT

	Fabricated structural steel, net tons	Portland cement shipments, barrels	Barrels cement to 1 ton steel
1913	1,215,000	88,689,377	73.0
1914	1,416,480	86,437,956	61.0
1915	1,987,200	86,891,681	43.7
1916	2,056,320	94,552,296	46.0
1917	1,713,360	90,703,474	52.9
1918	1,733,760	70,915,508	40.9
1919	1,723,680	85,612,899	49.7
1920	1,788,480	96,311,719	53.9
1921	1,188,600	95,507,147	80.4
1922	2,334,720	117,701,216	50.4
1923	2,433,600	135,912,118	55.8
1924	2,669,940	146,047,549	54.7
1925	2,998,080	157,295,212	52.4
1926	3,214,800	162,187,090	50.4
1927	2,853,750	170,922,000	59.9
1928	3,126,200	175,455,000	56.1
1929	3,588,400	169,394,000	47.2

In the last two years there has been a remarkably sharp drop in the ratio of cement to structural steel, while last year there was an absolute drop in cement. From 1905, when cement production was 35,000,000 bbl., to 1922 there was an average annual increase in cement of slightly more than 7%, while from 1922 to 1928 the average was almost 7%. Then for 1929 there was 3% decrease in cement but 15% increase in fabricated structural steel, while the increase in orders was even more, 17%.

New Feldspar Plant

FELDSPAR Co. of Canada, Ltd., which is associated with plants in Cleveland and Warsaw, N. Y., will start work at once on erection of a plant at Brockville, Ont.

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1928 AND 1929

Month	1928—Exports Barrels	Value	Exports—1929 Barrels	Value	1928—Imports Barrels	Value	Imports—1929 Barrels	Value
January	56,400	$204,875	78,639	$283,002	236,771	$315,797	151,302	$177,976
February	62,828	221,620	58,886	225,590	164,408	217,525	118,930	123,123
March	74,983	265,719	69,079	235,164	235,930	330,074	131,909	112,788
April	61,676	205,882	64,145	218,316	249,458	324,371	89,668	114,281
May	70,173	236,005	57,955	219,366	190,509	256,872	200,646	267,854
June	59,536	201,313	96,055	287,612	266,537	359,637	203,545	228,170
July	83,759	291,055	71,992	247,177	112,887	151,877	182,098	199,960
August	88,736	302,866	60,013	225,762	259,975	358,471	183,938	199,403
September	71,995	252,843	86,268	308.631	173,439	226,295	112,372	152,239
October	62,137	246,010	101,359	337.839	152,210	226,909	172,566	187,504
November	69,313	260,310	53,378	198.197	65,969	89,732	96,568	95,844
December	63,120	250,204	88,403	297,255	175,992	233,300	84,358	79,098
	824,656	$2,938,702	886,172	$3,083,911	2,284,085	$3,090,860	1,727,900	$1,938,240

Foreign Abstracts and Patent Review

Recovery of Waste Heat in Cement Plants. Lebrun, in discussing the effect of moisture content of cement slurry upon the heat balance of the cement plant, states that in the wet process nearly 30% of the total heat is lost in the waste gases. For example, in a kiln of 3 m. diameter and 55 m. length, capable of producing 200 metric tons of clinker in 24 hours, the coal consumption amounts to about 270 kg. per ton of clinker, the coal having a thermal value of 7500 W.E. Under this condition, the temperature of the waste gas at the stack is about 300 deg. C., so that the equivalent of 85 kg. of coal per ton of clinker is lost. At this temperature, the recovery of heat from the waste gases is rendered difficult.

In order to be able to generate sufficient steam to supply all the power requirements of the cement plant, the minimum waste gas temperature should be about 550 deg. C. When using a good waste heat recovery boiler and with waste gas at this temperature, from 0.700 to 0.800 kg. of steam of 20 kg./sq. cm. pressure and of 350 deg. C. temperature could be generated per kg. of clinker.

However, in order to be able to attain this result, only one method of feeding cement kilns appears to be practical, that of an automatic and continuous charging of raw mix, the moisture content of which has been reduced to 20% in order that the waste gas temperature at the stack could be raised to 550 deg. C. This process is effected by means of a Hertenbein continuous rotary filter which receives the slurry at 40 to 43% moisture content and feeds it at 20 to 23% moisture content directly into the kiln. The drum of this filter consists of independent juxtaposed sections, each covered with a filtering web. A chain-driven metal cylinder, placed on a parallel axis, revolves around this filter drum at the same peripheral speed; this cleaning roll removes the layers of sludge from the filter sections. The slurry is held to the filter sections automatically by means of a vacuum pump. When the filter section arrives at the set of kiln feeding rollers, the vacuum pressure is released, and by means of a slight pressure (10 gram per sq. cm.) the filter section swells slightly and the paste is detached.—*Revue des Mater, de Constru. et de Trav. Publ.* (1929), 242.

Effect of Pozzolanas and Lime Admixtures on Cement Clinker. Ferrari reviews the literature on the subject and presents from his researches test data obtained with mixtures of portland cement clinker and pozzolanas with or without lime, and of portland cement clinker and slag with or without lime. The article concerns the use of the pozzolanas and basic slags available in Italy.—*Industrie del Cemento* (1929) **26**, 8.

Gypsum in Cement. Nacken's paper at the meeting of the Society of German Portland Cement Manufacturers at Dresden, December 2 to 4, 1929, gave results of researches on various cement problems. The beautiful and bright crystal formation on a clinker of high per cent. limestone and 15% of santorin earth was analyzed and found to contain 83.82% $CaO \cdot Al_2O_3 \cdot SiO_2$. (Santorin is an earthy material high in silica and aluminum and low in lime.—Editor's note.)

In studying the behavior of cement and water when mixed with and when omitting the additive gypsum, it was found that the solubility of the $Ca(OH)_2$ increases very rapidly and is much greater when in contact with cement than when it is dissolved in water alone. Likewise, the solubility of the gypsum in water increases also when cement is added. It is assured that a protective colloid forms in the case of the hydrate of lime which increases solubility. It is assumed also that the presence of the semihydrate and the granular size are determinative for the increase in the solubility of the gypsum.

In the case of non-gypsum bearing cement the temperature rises much quicker than in the gypsum bearing cement, but the curves are of similar shape. The water binding was determined by allowing small cement samples to set for a certain period and then heating them for an hour to 230 deg. F. The water then remaining can be considered chemically fixed. If the best curves are compared with the water-binding curves, both show a rest period after the first prominent rise, and then a second reaction which leads to a rise in temperature to 90 deg. F. after 15 hours, in the case of non-gypsum bearing cement.

In testing these cements to determine the influence of various admixtures ($LiCl$, $NaCl$, KCl, $CaCl_2$, $BaCl_2$, HCl, H_2SO_4, HNO_3, $Ba(OH)_2$, $Ca(OH)_2$) there was a different effect for each admixture and each concentration, but in each case the second reaction could be recognized. The first reaction taking place is very intensive and leads to the formation of large quantities of calcium hydroxide. It can be assumed, therefore, that a high-lime portion of the cement, chiefly the high-lime silicates, is distintegrated vigorously by the water. If this reaction is to be retarded, a portion of the water must be withdrawn from the solution so that the work which is performed to form calcium hydroxide is constantly greater.

The second reaction takes place more intensively as the added solution becomes more concentrated, which points to the colloid-chemical nature of the second reaction. When gypsum is added, the influence of the SO_4 ion in the solution and also the influence of the water vapor which arises from the gypsum heated in grinding becomes noticeable, and both influences retard both reactions.

Further research has shown that the hydrogen-ion concentration has a part in influencing the reaction. According to Kuehl, in the discussion, the solubility of gypsum in cement is influenced by the formation of a calcium sulpho-aluminate, and the alkalies play a big part in the solution of high-lime silicates. Haegermann explains that the first reaction is a dissolving process and the second one a lime-binding process.—*Zement* (1929), **18**, 47, 48.

Improvement in Lime Burning. Cooled water is introduced in the sintering or burning zone of a lime kiln; the water is sufficiently cold that it cannot evaporate before coming into contact with the lime. The increased volume of steam suddenly generated has a greater effect, causing dissociation of the limestone; the driving off of the carbonic acid gas is accelerated and dead burning of the lime is prevented. Impingement of water upon the hot coke gives better results than that of steam, the coke consumption being decreased, a decrease which is helped by the accelerated removal of carbonic acid.—*German Patent No.* 485,981.

Specifications for Magnesite. F. Cordes adds to a previous report concerning proposed specifications for magnesite, giving a table of chemical analysis of 20 magnesites found on the German market.—*Baumarkt* (1930), **29**, 3.

Automatic Temperature Control for Moist Closets. Guttmann states that according to the new specifications for standard testing, the temperature in moist closets used for storing cement test specimens must be kept between 17 and 20 deg. C. instead of 15 to 18 deg. C. as heretofore. An apparatus has been built in co-operation with the A.E.G. of Duesseldorf, which maintains a certain predetermined temperature in the closet. It consists essentially of electric heaters immersed in the water, a mercury thermometer with platinum contact for automatically shutting off or turning on the electric current according to temperature conditions, and an electric motor-driven activator operating in unison with the heater, which assures a uniform temperature throughout the tank. As a result of using

this device, the temperature in the tank varies only 1/10th to 2/10th deg. C.—*Zement* (1930), **19,** 2.

Rotary Cement Kiln. Special sections are provided for each of the three stages of cement burning, i. e., preheating, burning and cooling. The cement material is burned in a short rotary kiln closed at one end and open and expanded at the other, the raw mix, fuel and combustion air being supplied through nozzles located at the expanded opening. The burning gases pass to the closed kiln end, then return and are discharged to the dust chamber. The preheating of the raw mix and its partial deoxidation takes place in a section through which the waste gases are passed and which is located in the dust chamber. Due to this preheating the sintering has been partly completed when the material arrives at the lining of the burning drum. The sintering is then completed in the return to the discharge of the burning drum. The finished material enters by way of a chute into a cooling drum located below the short burning drum.—*German Patent No.* 481,649.

Analysis of Lime. The free calcium hydroxide may be determined by adding 400 to 450 cc. of boiling water and 50 g. of sugar to 5 g. of lime, shaking, diluting to 500 cc., filtering and titrating the filtrate (the first 150 to 200 cc. being rejected) with hydrochloric acid, using phenolphthalein as indicator.—*Nauch. Zapiski* (1929), **8,** 22.

Electrical-Kiln Production of Cements and Limes. Component materials of cement are fed through a stationary, electrically heated zone by means of a forced draught. A number of resistance elements situated between the inner and outer walls of a kiln comprise the heating element.—*British Patent No.* 321,205.

High - Magnesia Early - High - Strength Portland Cement. Portland cement of high initial setting strength is made from materials containing magnesia, e.g., blast-furnace slag, by intensifying the calcination to above 1450 deg. for at least 20 min. to produce a clinker containing 5 to 15% MgO. —*British Patent No.* 309,069.

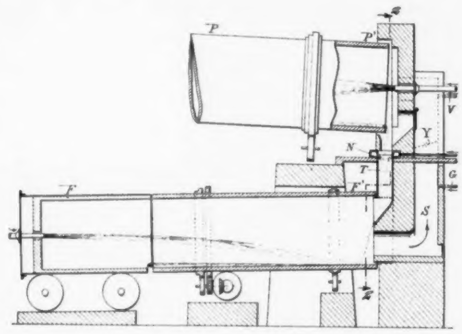
Oxychloride Cements. Magnesium or zinc chloride is treated in aqueous solution with an oxidizing agent, e.g., an alkali manganate or permanganate, hydrogen peroxide, before admixture with magnesium or zinc oxide.—*British Patent No.* 314,004.

Water-Cooled Grinding Mill. A tube mill, particularly for the fine grinding of rapid-hardening cement, is surrounded by a number of water-jacketed tubular bodies (rotating with it) through which the cement is caused to travel either by helical blades or by making the tubes slightly conical. Part of the cooling water may be sprayed on to the shell of the grinding mill.—*British Patent No.* 321,036.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Rotary Kiln Production of Fused Cements. The invention obviates the necessity of using electric furnaces for production of fused cements and utilizes an adaption of the ordinary rotary kiln methods for making sintered cements. The object of this invention is to provide means in an apparatus intended for the manufacture of fused cement wherein the operation of fusion is effected in two periods and in two separate kilns for preventing access of the high heat of the fusing kiln to the preparatory kiln, and thus avoiding fusing part of the materials in the preparatory kiln, which ordinarily causes the formation of an obstructing ring or elevation of material in the partially fused or pasty state between the two kilns.



Fused cement is prepared by calcination in two rotary kilns

In the first period the material is prepared generally in a rotary kiln of which the temperature may be regulated at will for the operation to be effected therein.

In the second period the fusion is carried out either in a rotary kiln, a fixed cylindrical kiln, a reverberatory kiln or generally any suitable kiln or fusion apparatus—*A. Bauchere and G. Arnow, U. S. No.* 1,739,383.

Quick-Setting Light-Weight Concrete. A concrete mass comprising crushed oyster shells (previously washed and soaked in fresh water), portland cement, filler (as sand), water and caustic soda. The resulting material can be drilled and sawed easily and is claimed to be tough and resistant to water.—*H. F. Adams, U. S. No.* 1,737,906.

Hardening Alberene Stone. Alberene stone, a mineral variety of talc or soapstone, in its natural state has a hardness between 2 and 3 on the Moh scale. By subjecting the natural stone to a temperature only sufficient to volatilize the water of composition of the group of silicates comprising the stone, and then maintaining this temperature until all the water of composition has volatilized, the hardness of the stone is materially increased to about 9 on the Moh scale. It must be understood that the natural stone includes a number of groups of hydrated silicates and in the process the water from each of these groups is driven off successively. The hardened stone can be used for floor tiling, etc. *Paul Mahler (assignor to Alberene Stone Co., New York), U. S. No.* 1,728,956.

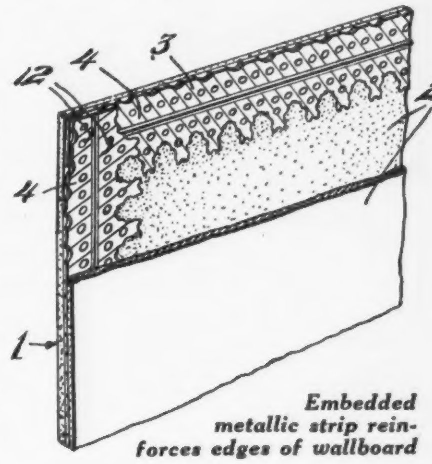
High Early Strength Portland Cement. Ordinary portland cement (80% to 87% minus 200-mesh) is ground to a fineness of from 94% to 98% minus 200-mesh. This fine ground product is added to the ordinary cement in the proportions of one part of the finer product to 2-6 parts of the normal cement, the whole intimately mixed to give a high early strength product. *G. A. White (assignor to International Precipitation Co., Los Angeles, Calif.), U. S. No.* 1,737,904.

Imitation Agate, Onyx, Marble, Etc. Phenolic condensation products selected according to desired color combinations are intermixed in approximate proportions and cold pressed into tablets or slugs. These materials are chosen to have different degrees of plasticity so that under heat there is a tendency for the more plastic to fill the openings and irregularities of the surface, thus producing a fanciful, veined design simulating natural onyx, marble, agate, etc. —*H. N. Copeland, U. S.* 1,735,674.

Waterproofing Concrete. Set concrete comprising a mineral aggregate, gelatinizing clay and a solid bituminous material fused into the voids of the concrete.—*Roy Cross, U. S. No.* 1,744,869.

Plaster Composition. A plaster composition for building purposes comprising about one part of plaster of paris, about one-quarter part of asbestos powder, about one-half part of sawdust, ¼ of 1% of retarder and a sufficient quantity of water to procure a mixture.—*F. M. Venzie, U. S. No.* 1,736,-294.

Improved Plaster Board. A thin, metallic strip is embedded within the plastic material to serve as a support for the edges and as a reinforcement between plaster board sections. The strip is arranged to prevent splitting or chipping of the edges and helps hold the nails or other fasteners used to secure the board to a frame. *Otho V. Kean, U. S. No.* 1,738,832.



Embedded metallic strip reinforces edges of wallboard

Manufacture of Mineral Wool

Abstract of a Report by J. R. Thoenen, Published as Circular No. 6142 by the U. S. Bureau of Mines

MINERAL WOOL is a substance composed of very fine, interlaced threads chiefly of calcium silicate or glass-like materials similar in appearance to wool or cotton. It is used mainly for insulating purposes; retention (or exclusion) of heat and sound control. Because of its acid-proof properties it is also used as packing for acid carboys and as a filter medium for acids and corrosive liquids and gases.

Mineral wool may be divided into two classes—rock wool and slag wool—based on the nature of the raw materials used in its manufacture. Rock wool is made from a natural siliceous limestone (more properly classified, perhaps, as a calcareous shale) found in northern Indiana[1] or from an artificial mixture of silica and limestone. Slag wool is made from iron blast-furnace slags with or without the addition of limestone to temper the charge.

History of the Industry

Rock wool was probably first made at Alexandria, Ind., in 1897 by C. C. Hall, manager of the Banner Rock Products Co. Mr. Hall, chemical engineer and manager of a steel plant at Alexandria, in the search for suitable rock for fluxing purposes in this plant, ascertained the peculiar composition of a local deposit. His first production of wool was on the premises of the steel plant, but as this plant was absorbed by one of the steel trusts then forming, Mr. Hall had to move such equipment as he had assembled. At this time he formed with some Alexandria friends a corporation known as the Crystal Chemical Co. This second plant was operated until about 1901 when it was sold to a St. Louis company which ultimately was succeeded by the present General Insulating and Manufacturing Co., with headquarters in St. Louis.[2] In 1906 Mr. Hall withdrew from this company and formed the Banner Rock Products Co., which has operated continuously since January, 1907.

The Union Fibre Co., Inc., for several years operated a small plant at Yorktown, Ind., but they have recently abandoned this site and moved to Wabash, Ind., where they have built a modern plant.

Mineral wool is at present manufactured by the companies listed below.

The Banner Rock Products Co. has recently been purchased by the Johns-Manville Corp., and the Columbia Mineral Wool Co. is subsidiary to the U. S. Mineral Wool Co. The plant of the Webber Cement Insulation Products Co. is understood to operate on slag from a local smelter and its whole wool product enters the market as an ingredient of insulating cements.

Mining Practice

For the manufacture of slag wool, the slag is loaded from the dumps either by hand or by mechanical shovel and transported to the manufacturing plant. Some operators have located their wool plants adjacent to old abandoned dumps and do their own loading. Others buy their slag from the iron companies which then reclaim the slag from the dump and deliver it to the wool operator. Often the material is transported for several miles. So far no wool plant is known to utilize slag while still molten.

The natural Indiana wool rock, on the other hand, is mined from open quarries. Cummings and Shrock[1] give a detailed description of the geology and occurrence of this rock, and the author[2] has described the general quarry practice. The shallow depths and thin beds of the material favor the use of hammer or piston drills, but at least one company has opened a deposit of considerable thickness and plans to install churn drills.

Some of the deposits are soft enough to be mined without blasting. Elsewhere as much as 1 lb. of explosive may be required per ton of rock broken.

Overburden is stripped by hand or steam shovel. The broken stone is loaded by hand or shovel and conveyed to stockpiles, where it is stored during the winter season to obviate mining except in summer.

Manufacturing Practice—Handling Materials

Both rock and slag are melted in cupolas very much like cast iron. To convey the raw materials to the tops of the cupolas various means are employed, among which may be mentioned bucket elevators, elevator and cars and cranes. Coke is the usual fuel employed and is charged in alternate layers with the slag or rock in the tops of the cupolas. The charge is proportioned at some plants by counting the shovels of each material; at others monorail buckets are used and the charge is proportioned entirely by weight.

Cupola Practice

The cupola in almost universal use is of the vertical-cylinder, water-jacketed steel type roughly 7½ ft. in diameter by 16 ft. in height. Blowing tuyeres are placed about 2 ft. above the bottom, and the molten material is drawn off near the bottom through a fire-clay lined opening. Air is introduced through the tuyeres by blower fans at low pressures. The bottom of the cupola is arranged with drop doors to facilitate cleaning. The water-jacketed cupolas are said to have a capacity of 1000 lb. of wool per hour and are operated continuously six days per week when in production.

Brick cupolas of the same general dimensions have been used in the past and are at present used by one company. The brick units operate only part of the 24 hours, and repairs to the lining are made while the cupolas are idle.

In some instances the water-jackets are used to generate steam for power purposes and for wool blowing.

Blowing Wool

The molten material issues from the bottom of the cupolas in a small stream, the flow and temperature of which are carefully regulated. The slag as it falls is broken up by a steam jet (at 80 to 100 lb. pressure) into minute balls or shot, which, while still in a molten condition, are propelled rapidly through the air. In passing comet-wise through the air, fine threads of glass-like material form as tails to the shot and fall in a fluffy mass on the floor of the wool room.

The best form and shape for the steam-jet blower is a subject of considerable controversy among operators. The various operators advocate their own particular design and maintain more or less secrecy concerning its details. Generally speaking they are all so arranged as to form the issuing steam into a trough which receives the falling slag.

Gathering Raw Wool

The wool blown into the wool rooms is gathered either by hand or on conveyor belts for further processing. Some operators arrange two wool rooms for each cupola, so that wool may be blown into one while being gathered by hand from the other. Others blow into one room and gather the wool while the cupola is down for repairs. More modern practice involves continuous blowing into a single wool room, the floor of which is formed by a moving conveyor belt

[1] Cummings, E. R., and Shrock, R. R., The Geology of the Silurian Rocks of Northern Indiana. Dept. of Conservation, Division of Geology, Indianapolis, Ind., Publication No. 75, 1928.

[2] Thoenen, J. R., Mineral Wool and Cement from Silicified Lime Rock. ROCK PRODUCTS, Feb. 21, 1925, p. 39.

COMPANIES EMPLOYED IN THE MANUFACTURE OF MINERAL WOOLS

Company and plant location	No. of furnaces	Kind of wool	Capacity (lb. per hour)
Banner Rock Products Co., Alexandria, Ind.	10	Rock	10,000
Johns-Manville Corp., Waukegan, Ill.	1	Slag	1,000
Johns-Manville Corp., Manville, N. J.	1	Slag	1,000
General Insulating & Mfg. Co., Alexandria, Ind.	6	Rock	6,000
Union Fibre Co., Inc. (Winona, Minn), Wabash, Ind.	2	Rock	4,000
United States Mineral Wool Co., Netcong, N. J.	3	Rock and slag	3,000
Columbia Mineral Wool Co., South Milwaukee, Wis.	2	Rock and slag	1,000
Webber Cement Insulation Products Co., East Chicago, Ind.	1	Slag	....

which gathers the wool automatically as it falls and passes it on for further processing.

Finished Products

Loose wool is the sole product of several plants and finds a ready market wherever a loose insulating material is required. Mineral wool is also used in loose form as a filter medium for acids and corrosive gases as well as for packing around acid carboys for shipment.

Loose wool is run through machines termed "granulators," the function of which is to break the shot from the fine threads and remove it. This treatment results in a short-fiber, shot-free wool which is used for mixing with other materials in the manufacture of insulating cements. This material is also used extensively as house insulation. The granulated wool is blown by low pressure into the spaces between the studding and joists of buildings already constructed and forms a very effective heat and sound insulator.

In addition to the method of using granulated wool for house insulation, as already noted, raw wool is placed between wire netting such as window screening, chicken wire or chicken wire and metal lath. These "blankets" are made in various sizes and thicknesses to suit consumers and for house insulation are placed directly on the studdings or between them. Where metal lath is used on one side, the lath is plastered in the usual manner. Similar products are made for refrigerator and cold-room linings. Blankets are also used for boiler and oven coverings, and are in turn covered by insulting cement. Covering for outdoor tanks in which liquids must be kept above freezing is a similar use for this class of fabrication.

Used in blankets or as loose wool, the material is said to be of great benefit in controlling the acoustic properties of buildings and in rendering noiseless small machinery units such as house refrigerator motors, etc.

Probably the greatest use for raw and granulated wool is in the manufacture of "rock cork" or "rock felt." Blocks of this material are made in various sizes and thicknesses for refrigerator lining. Raw or granulated wool, together with other ingredients and various binders, is mixed with water into a stiff mud and is placed on pallets and subjected to low pressure. These pallets are then run on racks into drying rooms and dried in a current of hot air.

This material is also molded into forms for pipe covering and is covered with cotton. Often it is reinforced with chicken wire.

High-temperature insulation is made from a mixture of refractory binders with the wool; the whole mixture is compressed into blocks or brick. Such material is used for covering glass and metallurgical furnaces, annealing and enameling ovens and for pipe coverings.

Various grades of raw wool are sold, depending on the consumer's specifications. No standards have as yet been set up. Some consumers demand that the wool shall be oiled, whereas others require that it be dry. Prices depend on competition with similar insulating materials and even for similar grades are likely to vary in different contracts.

The following prices are indicative only:

Raw wool—$20 to $25 per ton.

Granulated wool—up to $40 per ton.

"Flex felt" and "blankets"—8 to 10 cents per board foot.

Block—15 cents per board foot.

Cork board—7 cents per board foot.

Pipe coverings—standard 85% magnesia list, less 50%.

Brick—$100 per 1000.

Characteristics of Slags

SLAG in open-hearth furnaces is composed of the various oxides resulting from the elimination of the impurities manganese, phosphorus and silicon in the charge, sulphides resulting from the elimination of sulphur, usually present in relatively small amounts, iron oxide added or formed during the process, oxides such as lime which are added with the charge in order to flux the above-mentioned products of oxidation, and lime and magnesia resulting from the scorification of the furnace lining.

There are three primary reasons why slags are present in the process of steel manufacture:

1.—The elimination of the impurities mentioned above forms a slag, so that whether the steel-maker desires it or not a slag is always formed. By the addition of proper oxide fluxes, these impurities are held in the slag, and for a given type of slag the impurities may be eliminated to the degree desired in the steel product.

2.—If there were no slag, the metal would be continuously oxidized by the furnace gases. On the other hand, a certain amount of oxidation is necessary to eliminate carbon and various impurities. One of the main functions of the slag is, therefore, to prevent direct oxidation of the metal and to control the rate at which the metal is oxidized. This is very important, since the rate at which the metal is oxidized may very often be the primary factor in determining the quality of the product.

3.—The slag acts as a medium for scrubbing out non-metallic matter from the metal. This is generally termed "cleaning up the heat" by the practical operator. In order to clean up the heat properly the slag must have physical properties such as proper surface tension and proper viscosity.

The chemical analysis of the metal during refining is controlled by the chemical and physical characteristics of the slag, by the amounts of impurities introduced in the charge and by the temperature of the bath. The cleanliness of the metal (with respect to the non-metallic matters suspended therein) is controlled more by the physical than the chemical properties of the slag. Data on two important physical properties of slags, viscosity and surface tension, are almost entirely lacking.

Steel-making slags may be generally divided into two groups—oxidizing and non-oxidizing slags. In the present-day methods of open-hearth steel operation there are no non-oxidizing slags, these slags being confined to electric furnace operation, where the slag is deoxidized with carbon and calcium carbide is always present. Although the development of the manufacture of steel has taken tremendous steps in the past 40 years, very little has been done in the way of improving the quality of the slag, and the slags of the present day are very much of the same type as the slags of 40 years ago. The primary reason for this is that very little research has been done on slags other than those used in regular day-to-day operation. Obviously, an operator will make no radical changes in practice unless he has definite information on which to make the change. A study of the physical and chemical properties of various types of slags is therefore of fundamental importance.

A great deal of splendid work has been done by the geophysical laboratory of the Carnegie Institution of Washington on slag systems, and the steel industry has profited greatly through his work, which was not done with steel plant operation in mind. Researches on the physical and chemical characteristics of slags are being conducted at the Pittsburgh experiment station of the United States Bureau of Mines, in cooperation with the Carnegie Institute of Technology and the Metallurgical Advisory Board, as well as at other institutions. There is still, however, a tremendous field to be covered before the possibilities or limitations of various types of slags will be known.—*Iron Age.*

New Mineral Wool Plant Starts Operations

THE NEW MINERAL wool plant, located in the Clifty Cave region near Campbellsburg, Ind., for which an adequate water system has just been installed following the completion of the building, has started operation. John L. Duvall, former mayor of Indianapolis, who is one of the stockholders in the new company, has been in personal charge of the final construction work and is supervising the operation of the plant.

Tests which have been made of the limestone in this vicinity suitable for the manufacture of mineral wool have shown deposits of high quality and they are believed to be of considerable extent. New demands for the use of mineral wool in systems of electrical refrigeration, insulation in heating plants and in the preparation of the walls used in talking motion pictures have made a constant market. The largest plant in the state of Indiana for the manufacture of mineral wool is at Alexandria and it has increased its capacity and output considerably since it first began operation.

Southern Ohio, Indiana and Kentucky Mills Meet at Cincinnati

Regional Meeting of Safety Series Successfully Held

OPERATING officials, superintendents and foremen of the cement mills located in the southern parts of Ohio and Indiana and the state of Kentucky held the annual regional safety meeting of that group at the Hotel Gibson, Cincinnati, on February 11. Participating in the meeting were delegations from the mills of the Alpha Portland Cement Co., Ironton, Ohio, and Manheim, W. Va.; Kosmos Portland Cement Co. Kosmosdale, Ky.; Lehigh Portland Cement Co., Mitchell, Ind.; Lone Star Cement Co., Indiana, Mitchell, Ind.; Louisville Cement Co., Speed, Ind., and the Southwestern Portland Cement Co., Osborn, Ohio.

Distinguished Guests on Program

Among the distinguished persons who appeared on the program were Hon. Russell Wilson, mayor of Cincinnati; Hon. Thomas M. Gregory, industrial commissioner, state of Ohio; Hon. F. K. Hoehler, director of public welfare, city of Cincinnati, and Hon. Edgar D. Gilman, director of public utilities, city of Cincinnati. The presence of these guests served to emphasize the very great interest taken by municipal and state officials in accident prevention work in the industries in that vicinity. W. W. Hamilton, safety director of the Alpha Portland Cement Co., acted as general chairman.

At the morning session, John O'Callaghan, assistant superintendent of the Lone Star Cement Co.'s plant at Greencastle, Ind., discussed the effect of good plant "housekeeping" on accidents. He was followed by Dr. George G. Hunter, plant surgeon of the Alpha Portland Cement Co. at Ironton, Ohio. Dr. Hunter's paper on "Observations About Safety by a Plant Physician" is reproduced in part later on in this article. W. T. Groner, superintendent of the Southwestern Portland Cement Co.'s plant at Osborn, Ohio, described the improvement in the accident record at his mill during the last three years.

A. E. Snodgrass, director of personnel and safety of the Louisville Cement Co., presided at the luncheon and introduced Hon. Thomas M. Gregory, state industrial commissioner, who reviewed the improvement in the industrial accident situation in Ohio during recent years. At the afternoon session H. H. Purkhiser, assistant superintendent of the Lehigh Portland Cement Co.'s plant at Mitchell, Ind., presided in the absence of W. H. Weitknecht, who was unexpectedly detained.

The afternoon program was opened by Mayor Wilson of Cincinnati, an ardent devotee of industrial safety, who, in addition to his remarks on that subject, outlined a number of forward-looking city projects. Mayor Wilson was followed by Hon. Fred K. Hoehler, director of public welfare, who made a number of important suggestions in connection with the reporting of accidents and preventing their repetition.

W. O. Dunn, field engineer of E. I. duPont de Nemours and Co., presented an excellent paper on "Safe Handling of Explosives," and H. H. Purkhiser followed with an interesting discussion on the prevention of accidents in storing, packing and shipping departments.

Safety As Seen by the Plant Physician

Dr. George Hunter's paper, presented at the morning session, is in abstract as follows:

"War visits a generation but once, yet there goes on constantly a toll of human life that is as unnecessary as though taken on the field of battle. I refer to accidents to workmen in the great industrial field.

"Our first duty in selecting men for our plants is to get intelligent men. This may not mean educated people, but it does mean those possessed of 'mother wit' and 'horse sense.' The second great essential is a healthy, normal body, good eyes to see with, good ears to hear with and a disposition to make free use of them. This applies to all, from the big boss to the most recent employe. The third great requirement for every worker is to have a capable executive or leader who enjoys the confidence of his men and to such an extent that they implicitly and impulsively follow his leadership. The day an employe fails to follow is the proper day for his being discharged, and when the chief executive or departmental heads fail in leadership is a splendid day for corporate heads to 'sit up and take notice.'

Mutual Confidence Induces Plant Spirit

"This mutual confidence idea makes for plant spirit, and plant spirit is the secret of success in avoiding accidents. Every employe must feel that he is essential to the existence of the outfit; that he owns his job and must protect it day by day from being filched from him by putting forth his most intelligent effort, and that a breach of the safety rules is a first-class reason for his discharge. This, however, is disciplinary and, of course, up to plant authorities, but the same spirit of confidence, co-operation and plant spirit must obtain throughout every relation between the plant physician, the management and the men. To work intelligently and efficiently the plant physician must have the confidence of all parties concerned. No man wishes to submit himself to a physical examination, done by one who he may think antagonistic to him, and when instituting our system of periodic examinations we felt that no one should be discharged by reason of our findings, at least at this first time. This would inspire confidence. During my three years of service as plant physician I have never suggested the discharge of but one man for physical reasons.

"Because of the confidence felt in the physician as one of the employes of the same plant, workmen are often inclined to tell their family ailments, and one can give them helpful advice and suggestions. We also feel that our physical findings are being well taken. Men comply with our suggestions to have glasses fitted or changed, teeth extracted or repaired, heart and kidney conditions looked after, rheumatism, high blood pressure and various other conditions attended to.

Examinations Beneficial to All

"The fact that men are to undergo physical examination makes for better morals. If venereal disease bobs up, and it always has done so, even in the best regulated society, we advise men to get away from the plant, so as not to jeopardize their fellow workmen—to allege any disease from leprosy, smallpox to a 'home grown toe nail,' but to stay away. Neither syphilis nor gonorrhoea are an indication for discharge, unless they remain untreated. We have kept these confessions confidential, save for a notation upon their report blank.

"We feel that inasmuch as some of our older men have succumbed to apoplexy, it is well that all men have blood pressure taken by a mercury manometer. We also feel that a urine analysis is of vital importance. Excitement even of a trivial or even just threatening nature may be the last straw that breaks the camel's back. An injury slight in character or presence of albumin or sugar found in the urine may cause such a wound to remain permanently unhealed; syphilis untreated does exactly the same thing. Thousands upon top of thousands of dollars are paid out in workmen's compensation allowances due to someone's misconduct, rather than their accidental misfortune.

"We do not presume to know or be able to tell you just how to prevent accidents or

loss of health, but we have arrived at a few conclusions. We feel that psychology of an organized effort at safety, placing the blame for infractions of safety rules by the men themselves, is of very great importance. We also feel that the Alpha bonus plan is of great value.

"Another valuable thing is the reporting system, all plants working on the same general plan. The presence of a physician with his periodic examinations has been of great value to our plant organization, but 'plant spirit' is the thing that has gone farthest in helping us with our several years of successful operation."

Safe Handling of Explosives

Mr. Dunn's paper in extract was as follows:

"Explosives can be handled by methods which will insure absolute safety, provided that we follow instructions of those who really know explosives and have made a life study of their possibilities.

"Explosives are safe enough until they are misused or improperly handled. Explosives do not detonate of their own accord or without cause. There is a reason for every explosion, whether accidental or otherwise, but unfortunately in cases of accident, especially fatal ones, we may not learn the cause as those who might have told us were the victims.

Investigations of Mishaps Check Recurrence

"Under organized safety work, accidents are carefully investigated with the idea of finding the exact cause and avoiding a recurrence. The federal and state authorities stand ready to help operating companies using explosives by giving them the benefit of the results of extensive research in the explosive line.

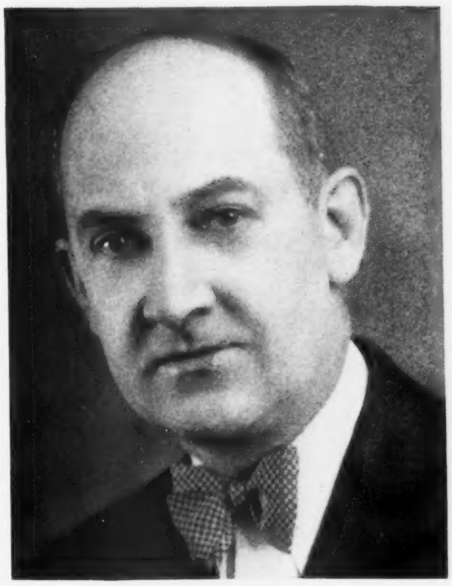
"Furthermore, the explosive firm from whom you purchase is anxious to co-operate with you, even to the point of sending a technical representative to your plant to make a study of conditions from a standpoint of safety and efficiency.

"Explosives reach their highest degree of service in the hands of men who make a study of their potential energy from the standpoint of efficiency and safety and this takes in every man from the superintendent down that has to do with preparing and handling of blasting problems.

Sugestions Rather Than Rules

"Consider some of the factors met in loading what is termed 'a well-drill shot' in a quarry, making suggestions rather than rules of 'Do's and Don'ts.'

"First, be sure the storage is properly located as to fire hazards and yet convenient; being sure all dead grass and brush is cleared away to safe distance. See that building is weather-proof, yet ventilated under floor and at roof. Place the shipment as received so



Dr. George Hunter

as to move oldest stock first. Have someone who is held responsible for explosive stock and magazines, as everybody's business is very often nobody's business.

"Should you at any time find that you have in your magazine explosives that are unfit for use, either from age, exposure to moisture or whatever cause, set them aside and notify your explosive manufacturer, who will be glad to send a man to inspect the material and make or recommend safe disposition of them. Do not in any case attempt to destroy such explosives except under direct supervision of someone who is thoroughly competent and familiar with such work. The explosive manufacturer's representative will also direct the removal of any stains from magazine floors and look after any other hazards that may be found there.

"Keep the road to magazine and from magazine to quarry face in good repair. Explosives do not have to be handled like a crate of eggs, yet a smooth road is safer than a rough one, and will also save wear and tear on trucks, wagons, horses and dispositions of the men so employed.

Complete Preparation Essential

"When ready for a large blast, make your plans carefully, getting everything lined up the day before, as far as possible, taking measurements of the shot as to area and depth of holes; where a shot has been drilled and allowed to stand any length of time before loading it is often necessary to bring the drill back and clean out the holes which have partly filled with silt from heavy rains, and it is mighty disconcerting to find a number of holes as much as 25 ft. short when all ready to load.

"Deliver explosives on quarry top only as fast as needed by loading crew piling conveniently near, but not out on the shot, from where it can be carried to each hole and opened as loading demands. Have loading crew organized so each man has certain duties and see that he understands them, so that the work moves along in a smooth manner and above all do not hurry the work, as undue haste has no place in handling of explosives. Open boxes with a wooden mallet and keep empty boxes at the hole you are loading as a recheck until hole is finished.

"Have the size of the shell as near size of drill hole as practical. A 5-in. shell will load nicely in a regulation 5⅝-in. hole, and if shells are dropped in holes they will travel truer and safer at above ratio than if a 4-in. shell were used in the same hole. Furthermore, they will not require any tamping, as they seat themselves and spread to near the diameter of the hole.

Loading Ragged Holes Safely

"In case part of the hole is ragged and there is chance of shells logging part way down, provide a spear of soft wood, a piece of box lid will answer, attach to a line and insert into center of shell end, so it will hang plumb, then lower past rough part of hole and a slight jerk on line will loosen spear and allow shell to drop to its place. The reason for using soft wooden spear is that in case it gets crossed or fast in hole it can be readily broken by pull on the line, while a spear of hard wood may mean the loss of that much rope, if it becomes fast, and possibly the loss of the hole. After shot is loaded, detach spear and drop in last hole, as it will be found to have absorbed a certain amount of dynamite, and is not a safe thing to allow lying around.

"If shell should become lodged in the barrel of the hole, do not attempt to drive or force it free with a tamping post, but provide a 2 by 4 about 12 ft. long and cut one end 2 by 2 back for a distance of 3 ft., making square shoulder and chisel point, not round; bore a hole in the other end and attach line. This can be lowered to the stuck shell and the 2 by 2 with chisel point will cut up or go through the shell and square shoulder will clear the hole. The length gives the required weight.

"For stemming or tamping material rock dust or screening have been found most suitable, as it will run freely and properly settle in the hole, sealing it without use of a tamping block or pole. Use of tamping block after charge has been loaded is to be avoided because of possible damage to cordeau line or electric cap wires.

Keep Visitors Out

"Above all, do not allow visitors on the shot while loading is in process; not even men of the plant who are not engaged in actual work of loading the shot. Do not allow any smoking by anyone, at or near the shot or explosives. Some men will tell you that fire from a cigaret or pipe will not ignite dynamite, but don't believe it. It will and it has happened with fatal results.

"When all is ready, see that everyone is

in the clear, make a last inspection of connections of cordeau or wires. Do not connect lead lines to power lines (even though you know power is off) or battery before making final connections at the shot and be sure lead lines do not pass near or under power lines on poles.

"In firing cordeau shot with cap and fuse cut two pieces of fuse, place cap on each one, attaching one to the trunk line with regulation connection provided; then cut about 4 in. from the loose fuse and when ready to fire light both fuses, tossing the one over the face or put in a safe place. This extra fuse and cap will act as a warning, firing about 10 seconds before the shot and will relieve the anxious moment of waiting for the blast.

"Secondary blasting or shooting of pop holes requires just as much care, if we would play safe. A strong tight box or magazine should be kept at a safe and convenient point in a quarry large enough to carry supply of dynamite for one day's shooting.

Safeguarding the Shooter

"The shooter should be provided with a box with cover and separate box or container for caps and fuse. Do not attempt to light too many shots at one time. Much has been said about how many fuses one man can light and get away with safely. A man may do it today and fail tomorrow. A good practice is to cut fuses all the same length, depending on position of shots and distance to shelter. Then when all ready to fire, let the lighter, or one of them, light a fuse and cap at point of shelter or safety, placing cap in a safe place, but where it can be heard, then proceed to the shots to be fired and start lighting. When the cap back at the shelter point fires, he knows he has just time to reach that haven of refuge himself.

"A powder man should check and account for every cap that comes out of stock, or into his possession, and keep supplies under lock and key. Remember, at all times in regard to explosives of any kind that 'it only needs to happen *once* in so far as we are concerned.'"

Storing, Packing and Shipping Problems

The following is extracted from Mr. Purkhiser's discussion of accident prevention in cement storage, packing and shipping departments:

"In these departments, the screw conveyor and sliding materials have always been among the leading hazards. The greatest danger in the operation of spiral screw conveyors is that of workmen getting their hands or feet caught in the conveyor. When the conveyors become clogged, workmen sometimes endeavor to dislodge the material without first shutting off the power. In so doing they take a chance of having their hands or feet caught in the conveyor, and other employes—not knowing the conveyor lids have been removed, in order to release the clogged condition—step into the conveyor, resulting in serious injury.

"Under no conditions should an attempt be made to loosen material in a screw conveyor trough or to make repairs without first shutting off the power and locking the motor switches, as well as hanging *on* the starting switch a danger tag reading, 'Man Working on Conveyor.'

"Recent installations, where pumps and

H. H. Purkhiser

transport lines are used for conveying cement, have eliminated the screw conveyor hazard. However, the same precautions in regard to making repair to the pump or the transport line serving same, with respect to locking motor switches and displaying danger tags, should be followed.

"In the modern type storages of silo construction most of the hazards due to the open bin, or stockhouse type of storage, have been removed. Nevertheless care should be taken that all manhole openings in the tops of the silos be equipped with permanent gratings and a dust tight cover. Care should be taken that the gratings be permanently anchored and sealed. The foreman in charge should report any occasion requiring the breaking of the seal.

"In case it is necessary to clean out silos, compressed air can be used with the help of a long pipe to break down any arches, or piles of cement, which may hang to the silo walls. When loosening cement with an air lance men should be cautioned to push the lance into the cement before opening the air cock. The air cock must be closed before withdrawing the lance. If these precautions are observed there is little likelihood of a man getting a face full of cement. Sometimes it is necessary for men to enter the silos with a long bar to break down the lumps on the side walls. In this case the men should wear safety belts. They should also be provided with and required to wear respirators.

"A large number of accidents in the packing room and stock houses are caused by cement spurting into the face and eyes of the packing machine operators, due to a bag bursting, or a small hole in it. This type of hazard can be eliminated, partly by the proper location of the seat on which the machine operator sits, and entirely, by compelling operators to wear goggles."

Registration

REGISTRATION, REGIONAL SAFETY MEETING, CINCINNATI, OHIO

Alpha Portland Cement Co., Easton, Penn.
W. W. Hamilton, safety engineer.

Alpha Portland Cement Co., Manheim, W. Va.
Francis W. Gibson, timekeeper.
R. M. Hertzog, paymaster.
N. D. Hooton, analyst.

Alpha Portland Cement Co., Ironton, Ohio
F. C. Brownstead, superintendent.
Delbert Huddle, mill foreman.
Dr. George G. Hunter, plant physician.
Albert Madden, time clerk.
Arthur McCarley, foreman bag department.
C. E. Whittlatch, packing foreman.

Kosmos Portland Cement Co., Kosmosdale, Ky.
H. A. Downs, construction foreman.
H. M. Graybill, chief engineer.
J. H. Smith.
F. G. Tiedemann, purchasing agent.

Lehigh Portland Cement Co., Mitchell, Ind.
Lloyd E. Bixler, timekeeper.
A. N. Palmer, chief clerk.
H. H. Purkhiser, assistant superintendent.
J. B. Sims, general foreman.
Walter Smith, sheet metal foreman.
Albert Stout, kiln department.
Walter Stroud, shop foreman.
Harry Whittington, quarry foreman.

Lone Star Cement Co. Indiana, Greencastle, Ind.
Raymond Baldwin, chief electrician.
Otto Carty, general foreman.
R. H. Fuller, packhouse foreman.
William Huber, head burner.
John O'Callaghan, assistant superintendent.
Edwin Rogers, assistant quarry foreman.
Albert Shuey, safety manager.
Hugh H. Walker, secretary safety committee.

Louisville Cement Co., Speed, Ind.
Claud L. Baylor, safety engineer.
J. M. Buchheit, superintendent.
Warren Botterff, general foreman.
Jesse G. Dorsy, welfare director.
Fred Enders, powder foreman.
Orville Hall, powder man.
Arthur Heath, kiln oiler.
Kark Kaamn, power plant foreman.
Thomas McDonald, construction engineer.
William Pass, mill foreman.
Harry T. Regan, quarry foreman.
Jesse Riggle, chief electrician.
Carl E. Seibel, Bates machine operator.
A. E. Snodgrass, personnel department.
John Stewart, assistant foreman.
Lester M. Townsend, carpenter foreman.
John Wells, painter foreman.
Charles Werle, kiln burner.
J. G. Williamson, chemist.

Southwestern Portland Cement Co., Osborn, Ohio
Mentor C. Addicks, engineer draftsman.
H. L. Clifton, carpenter foreman.
J. W. Cook, safety director.
O. R. Cornelius, auditing department.
F. Esterlin, quarryman.
W. T. Groner, superintendent.
L. D. Hower, crushing department.
S. T. Randall, shipping clerk.
H. A. Schaffer, consulting engineer.
H. Stine, locomotive engineer.
Ralph Tanksley, kiln burner.
H. W. Warner, chemist.
E. R. Yingling, coal miller.

Miscellaneous
A. J. R. Curtis, Portland Cement Association.
W. O. Dunn, representative technical section, E. I. du Pont de Nemours and Co., Wilmington, Del.
Edgar Don Gilman, director of public utilities, Cincinnati, Ohio.
Thomas S. Gregory, compensation commissioner, state of Ohio.
F. K. Hoehler, director of public welfare, Cincinnati, Ohio.
George G. Hunter, M. D., Ironton, Ohio.
H. G. Jacobsen, Bates Valve Bag Corp., Chicago.
L. Keane, salesman, Hercules Powder Co., Pittsburgh, Penn.
Russell Wilson, mayor, Cincinnati, Ohio.

Quarrying and Origin of Anhydrite Discussed by Mining Engineers

American Institute of Mining and Metallurgical Engineers' Annual Meeting at New York City

THE INTEREST of rock products producers in the nonmetallic minerals committee of the American Institute of Mining and Metallurgical Engineers continues to grow, even if slowly. The all-day session of the committee, under **Dr. Oliver Bowles** (United States Bureau of Mines), chairman, and **W. M. Weigel** (Missouri Pacific Ry.), vice-chairman, in connection with the Institute's annual meeting, February 17, was well attended and the discussions were quite lively and pointed.

Wire Sawing Marble

W. M. Weigel presented a paper on "An Application of the Wire Saw in Marble Quarrying," in which he described the operation of the St. Clair Marble Co., near Guion, Ark. His conclusions were:

"The costs shown in the accompanying table are those of one particular cut, which was 75 ft. long and 10 ft. deep, made in the Kimmswick formation. These are direct costs only and do not include the so-called overhead expenses of supervision, taxes, etc., or any depreciation on the equipment.

COSTS OF ONE PARTICULAR CUT IN MARBLE QUARRYING

Area of cut, 10 by 75 ft. = 750 sq. ft.
Time required, 70 hr., or 10.7 sq. ft. per hr.

1400 ft. ¼-in. wire strand	$26.15
1 man, 70 hr. at 25c	17.50
3 men, setting up 1 day, 30 hr. at 25c	7.50
4 tons sand at $1	4.00
70 gal. gasoline at 20c	14.00
Water supply, estimated	2.50
Total direct cost of 750 sq. ft.	$71.65
Cost per sq. ft.	0.0955

Successful but Not Entirely Satisfactory

"This installation is extremely simple and requires a minimum amount of supervision. It is still in an experimental stage, as up to date (October, 1929) only four cuts have been completed, so that while it seems to be successful it is not safe to say that it is entirely satisfactory. Conditions are ideal in this particular place, as the quarry face is open at both ends, so that there is no expense of preparing openings for the sheave standards. As the quarry face advances, the cuts will become much longer, and it is questionable whether a wire of the necessary length will have sufficient tension to complete the cut at the center to something near the same depth as at the ends, within a reasonable time, and also have sufficient reserve strength to allow it to be pulled through the cut."

The discussion concerned mostly the kind of sand best suited to wire sawing. The conclusion was that there is not much difference in the service silica sands, whether rounded or sharp, since the grain break up in the sawing. But any silica sand is preferable to ordinary river sand.

Huge Limestone Mine Chambers

P. F. Minister (East Butte Copper Mining Co., Butte, Mont.) described the operation of the company's limestone mine at Lime Spur, Mont. Most of the limestone now mined goes to beet sugar factories. In spite of the fact that Mr. Minister is a mining engineer and his operation, at least to other limestone producers, is a mine, he referred to it throughout his paper as a *quarry*. He said, in part:

"In the west half of the quarry the beds strike north 70 deg. east, but midway they commence to swing until they now strike north 45 deg. east in the east end of the workings. The general average dip is 40 deg. northwest. The bottom part of the cliff face at the quarry consists of alternating relatively thin beds of high-calcium and dolomitic or magnesium limestone. Some of these dolomitic beds are cherty. Above these beds is a single massive bed of nearly pure calcium carbonate from 90 to 100 ft. thick. Overlying this is a massive bed of dolomitic limestone and then above this comes the jaspery portion of the Madison limestone. The 90- to 100-ft. bed of pure limestone is the one which is being quarried.

Underground "Glory Hole" Methods

"The system of operation employed might be called an underground 'glory hole.' It consists in driving a drift along the footwall contact of the pure bed, and then from this drift driving raises at intervals of 360 ft. directly up the dip of the bed, on top of the footwall contact, to the surface on the face of the cliff. At the start of a raise a bin and grizzly, with capacity for two railroad cars of broken rock, is excavated for and constructed at the bottom end of the raise in order that the broken rock from the raise and from quarry operations may be loaded into the quarry cars. After the raise has holed out to surface the miners then drop down approximately 30 ft. from the top of the raise and commence to widen out at the sides and top. This widening-out process is continued and expanded somewhat in the shape of a fan until the hanging-wall contact of the pure limestone is reached. This undercuts the face of the cliff and leaves a pillar to support the brow or point of the overlying dolomitic limestone. Openings are driven at intervals through this pillar in order to admit daylight and give proper ventilation. After this undercutting is completed the miners then drop down again to the raise to develop the regular incline method of benching the rock, as used in the open quarry. From this point on, benching continues from the top of the raise on down and as rock is excavated a great cavern is eventually developed. This process is continued until all rock is excavated down to the grizzly level over the bin, at the bottom of the raise."

The process described leaves great inclined chambers something like 150 ft. high, vertically and 300 ft. wide between pillars. Most of the discussion was questioning of the safety of such large chambers.

Cement Rock Quarry

L. James Boucher's paper on "Limestone Quarrying at Northampton Plant of the Universal-Atlas Cement Co." is given in abstract at some length elsewhere in this issue.

Formation of Anhydrite

H. B. Bailey's (Fredericton, N. B., Canada,) paper on "Hydration Factors in Gypsum Deposits of the Maritime Provinces" proposed a novel theory to account for the geological relation of gypsum to anhydrite in the Nova Scotia deposits, an abstract of which follows:

"This paper is not concerned with the general theories of original deposition and no opinion is expressed as to whether gypsum or anhydrite was first deposited from evaporating sea water. For purposes of study, and as an observed fact, except in the few cases where there has been extreme disturbance, a block of the formation is regarded as a block of anhydrite which has become partly hydrated into gypsum.

"Hydration is the chemical action of water, which changes anhydrite to gypsum, but geologically the aspect to be studied comprises the physical conditions under which the water is applied to the anhydrite surface. Water pressure, temperature and time are obvious factors in this action, and of these three time is the main factor—ages of geological time. This paper hopes to show that there are less obvious factors of importance, such as rock pressure and the medium through which the water is applied.

"The words 'top hydration,' 'bottom hydration,' 'side hydration' and 'interior hydration' are terms developed by the writer, to denote the position from which the water is applied.

Nature of Overburden Effects Hydration

"It may be said that as a matter of economic interest the overburden will run from zero, or no cover, to 250 ft., because at greater depths than this the formation is likely to be entirely anhydrite and any gypsum that might be found would not be available for commercial operation. The overburden may consist of salt or fresh water, organic matter or forest cover; soft clays; glacial boulders or boulder clay; gravels, sedimentary rocks such as red conglomerate or gray sandstone.

"All of these, from their physical and perhaps also their chemical nature, have an effect on the rate and amount of hydration; therefore, it is not only the depth of cover but the kind of cover that indicates what is likely to be found beneath."

The author then described the supposed mechanics of hydration in some detail.

In the absence of the author the paper was presented by **H. E. Brookby** (consulting engineer and chemist, Chicago, Ill.), who discussed it briefly. **H. J. Brown** (consulting engineer and chemist, Boston, Mass.), also discussed the subject. Both agreed the theory was novel and original, if not entirely acceptable.

Western Phosphate

Frank Cole (superintendent, phosphate plant, Anaconda Copper Mining Co., Anaconda, Mont.), not being present, his paper on "Status of Phosphate Industry of Western United States" was read by title only. An abstract of this paper gives the following data:

"Over 98% of the phosphate rock mined in the United States to the present date has been mined in Florida and Tennessee. A fairly recent estimate by the United States Geological Survey showed approximately 215,000,000 tons available in Florida, 85,000,000 tons in Tennessee, and 5,000,000,000 tons in Utah, Idaho, Wyoming and Montana. For the year 1927, Florida was mining about 2,540,000 tons or depleting her available stock of phosphate rock 1.2% per year; Tennessee was mining about 440,000 tons or depleting the available stock 0.52%, while the western deposits were mining 48,000 tons per year, an almost negligible percentage. These figures tend to show that in the course of a few decades the western phosphate mines will produce more and more of the available phosphate rock used in the United States.

Underground Mixing Favored

"Although there are 12 developed phosphate mines in the western area, only 3 of them were mining rock this year, and the Anaconda phosphate mine at Conda, Idaho, was producing 80% or more of the rock mined in this area. Mining at these western mines is done by underground methods. This differs from the open-pit, drag-line, and hydraulic methods usually followed in Tennessee and Florida. However, the cost of underground mining is favored by recovering about 0.94 dry tons of rock for each ton mined, whereas in the South as much as 10 tons is handled to produce one dry ton of marketable rock.

"Under present conditions, western phosphate rock cannot be sent to eastern or southern markets, due to the long haul. Neither is there any prospect of reaching these markets if the rock is manufactured into 16 to 20% superphosphate. Only by manufacturing this rock into double or treble superphosphate, concentrated phosphoric acid, and combinations of phosphoric acid with ammonia and potash can these phosphates reach present markets on a competitive basis.

"At the present time several large western smelters are burning large quantities of sulfur in the reduction of metallic ores. From a portion of this sulfur, sulfuric acid may be manufactured economically. This combination of reasonably cheap sulfuric acid and phosphate rock offers a method for the production of concentrated phosphates that can reach a portion of the present markets, as well as take care of the western demand as it develops with the increased use of fertilizer in the region."

Recent Developments in Nonmetallics

Dr. Oliver Bowles briefly summarized recent developments in the nonmetallic mineral industries, most of which are undoubtedly familiar to most Rock Products readers. Two items in the discussion of Dr. Bowles' paper are particularly interesting.

Hugh S. Spence (Ottawa, Ont.) described the use of feldspar for glass manufacture as follows:

"The Canadian feldspar production may be stimulated in the near future, owing to the erection at Oshawa, Ont., of a glass plant designed to use feldspar as practically the sole raw material. The company claims to have perfected all the technical details of manufacture, and expects to be in production early in 1930. Bottles, of the beverage and milk types, will constitute the output.

"The spar, ground to 60-mesh, is melted in a 40-ton, rectangular, melting furnace and is then run to a circular, refining furnace, from which the finished glass flows to the bottle machines. Both furnaces are heated electrically. It is claimed for the process that the production cost will be only a fraction of that of bottles made from the usual raw materials, and that the glass is much tougher than ordinary bottle glass. Mine-run spar is to be used, the presence of ferromagnesian mineral impurities being no detriment; the laid-down cost from the company's own mines in the Perth district is estimated at $5 per ton. The estimated consumption of spar will be a carload per day, equivalent to 10,000 to 12,000 tons per year."

Hugh S. Spence (Ottawa, Ont.) also contributed the following in regard to the prospects of developing phosphate resources in British Columbia:

"The apatite industry of Ontario and Quebec has been virtually dead for the past 30 years and Canada has imported almost all her raw phosphate rock for fertilizer and phosphorus manufacture.

"The Consolidated Mining and Smelting Co. of Trail, B. C., during the past year or two, has been investigating the commercial possibilities of low-grade, sedimentary phosphate beds in the Crows Nest district, B. C., with a view to finding raw material for the manufacture of acid phosphate, utilizing sulfuric acid made from waste smelter fumes. A deposit of what is claimed to be suitable rock has been located near Fernie, and trial amounts of fertilizer have been made from it at Trail and tested out at several experiment stations in the Prairie Provinces. The results are reported to be satisfactory, and the company is proceeding with the erection of a larger fertilizer plant at Trail. It is understood that triple superphosphate will be made, and that eventually nitrates will be made from atmospheric nitrogen."

Iowa Products Association Holds Annual Meeting

THE eleventh annual convention of the Iowa Concrete Products Association was recently held in Des Moines, Iowa. A number of interesting papers on all phases of concrete products, from manufacture to sales, featured the program.

Scientific advertising was discussed by L. R. Fairall of Des Moines, who told the gathering that business for the next five years was largely dependent more and more on sound and instructive education through reliable methods. George B. Smith of Springfield, Ill., spoke on "Coloring Concrete Products," and "The Best Sale Made Last Year and How It Was Made" was the subject of an open forum discussion by the delegates.

At the conclusion of the program sessions, F. D. Reeve of Sibley was elected president. D. I. Roland of Cedar Rapids, vice-president, and R. L. Gavin of Des Moines was re-elected secretary and treasurer.

Texas May Tax Rock Products

REPRESENTATIVE LEONARD TILLOTSON of Sealy, Tex., has introduced a bill before the Texas State legislature proposing an occupation tax on certain natural resources, including sulphur, gas, salt, coal, lignite, marble, stone, gravel, sand, shells and other deposits.

The bills were announced at a recent hearing of the revenue and taxation committees. —*Austin* (Tex.) *Statesman.*

Limestone Quarrying at the Northampton Plant, Universal-Atlas Cement Co.*

By L. James Boucher
Assistant Plant Manager, Northampton, Penn.

THE NORTHAMPTON plant is in the Lehigh Valley of eastern Pennsylvania, commonly known as "the heart of the cement industry." The cement rock deposit of the Lehigh district of Pennsylvania and New Jersey is of the Jackson series of the Trenton limestone. It varies in thickness from 150 to 300 ft. Composition varies greatly, as shown by the analyses of samples from different churn drill holes (Table 1).

TABLE 1—ANALYSES OF SAMPLES FROM CHURN DRILL HOLES

	Hole No. 1	Hole No. 2	Hole No. 3
SiO_2	25.60	12.42	11.02
R_2O_3*	7.24	6.20	5.46
$CaCO_3$	61.80	75.42	78.56
$MgCO_3$	3.76	4.26	4.26
	98.40	98.30	99.30

*R_2O_3 indicates iron and aluminum oxides. No. 1 requires addition of limestone for composition; No. 2 requires no additional limestone or clay; No. 3 requires addition of clay.

It is due to the proximity of a great deposit of cement rock of an excellent quality and the accessibility to the markets that the Atlas company operates the largest cement plant in the world at Northampton. This plant has a capacity of over 20,000 bbl. of cement every 24 hours. Approximately 5000 tons of cement rock and 500 tons of high-grade limestone are used daily for the manufacture of this great quantity of cement. To furnish the cement rock, a quarry or open-pit mine having a capacity of 600 tons per hour is operated.

Stripping

The overburden of loam and clay is from 3 to 30 ft. deep, but averages approximately 9 ft. As the surface is comparatively flat and contamination of nearby streams is forbidden, hydraulic stripping is not practical; therefore the overburden is removed by means of a size 9½ Bucyrus steam dragline equipped with a 45-ft. boom and 1½-yd. dipper.

The material removed by the dragline is loaded into 6-yd. Western side-dump cars having standard gage trucks. The cars are moved to a waste dump by means of an air-driven hoist with a single wire rope, which hoists them up a grade of approximately 0.5% to a point near the hoist from which they are lowered by gravity to the dump, 1000 ft. or more from the quarry face. The waste dump is over rock which, by former prospecting, has been found to be of no value. Three cars are hauled to a trip, and the arrangement is such that empty cars may be set for loading while those previously loaded are being dumped.

Stripping is used only when advance of the upper level face makes it necessary. Since a new lower level was opened this advance has been very slow, thus reducing stripping work to a few summer months. The rock is removed from two levels, the upper level having a face varying from 100 to 160 ft. in height and the lower face being 40 ft. high. As the deposit is of great depth, more levels may be added as required.

The stripping crew consists of a foreman, dragline operator, fireman, hoist operator, and from 4 to 10 men (average 8) for dumping, trimming and shifting track. An average of 600 yd. of earth is removed and disposed of in a 10-hour day. The yardage is not great; however, when one considers that for every yard of overburden removed, approximately 50 tons of cement rock is made available for the present working levels, and much more below, the logic of the use of comparatively small, though efficient, stripping equipment at this quarry is obvious.

Drilling

All the rock is blasted down by initial shots in quantities varying from 20,000 to 140,000 tons at a time, depending on the height of the face, location and composition of rock required. All initial blasts are made with churn drill holes 5¼ in. dia. As the bedding planes, varying from 4 in. to several feet in thickness, dip approximately 25 deg., it is necessary to "make" the quarry floor grade. To do this the churn drill holes extend 6 ft. below the desired grade on the high face and 4 ft. below on the 40-ft. level. Spacing of holes depends usually upon the height of the face. Where the face is 150 ft. high, a single row of holes is drilled 28 ft. back from the face and spaced 28 ft. apart. For blasting the lower 40 ft. the holes are drilled in a double row parallel to the face. The first, or near row, is placed 18 ft. back from the edge, and the second, or back row, 15 ft. from the first. All are spaced 18 ft. apart and as far as possible staggered, thus securing maximum fragmentation.

Churn drilling is done with size 14 standard "Cyclone" and size 2G "Clipper" well drills. All well drills are of traction type, with gasoline engines. The drill tools consist of a one-piece rope socket, a 4-in. dia. drill stem and bit, all secured together with box-and-pin tapered thread joints. The approximate weight of the set is 1000 lb. A 5¼-in. dia. bit with a concave cutting edge, called the Gill bit, is used exclusively. It has been found that this type of drill is considerably faster than the old standard V type, or bull bit. The cutting edge, size and shape of face are maintained by a Gill well-drill bit power sharpener. A machine of this type does away with much heavy sledging and insures uniform size and shape. Such a bit-dressing machine is essential to economical churn drilling, where considerable footage is needed, as is the small bit power sharpener which has so long been indispensable to mine and quarry work. One blacksmith and a helper, with the aid of the well-bit dressing machine and a Leyner bit sharpener, easily keep all the bits in shape for the quarry needs and have time for other "odd jobs."

Drill Rigs

Three drill rigs are used for blast holes and a fourth occasionally for prospecting. Each drill has a crew of two men, a driller and helper. As the surface is fairly level and smooth, they seldom require help for moving from the completed hole or away from the blast. An average of 58 drill hours per day is necessary to drill the required footage of 220 ft. or 3.8 ft. per hour including moving, delays for blasting, and miscellaneous use of drill crews for other work; 6 ft. per operating hour is not unusual.

The drilling speed of the churn drills could be increased by using heavier tools of larger diameter, but this would necessitate the use of bits of larger diameters in order to secure clearance. This would, of course, result in holes of greater diameter, which would allow greater concentration of explosives in the hole. This is not desirable for securing the best fragmentation in the cement rock formation. It has been found that the most economical blasting and the best results are obtained by drilling holes of smaller diameters closer together and spreading the column of explosives over a greater height of hole.

As previously mentioned, a drill rig is used for "prospecting." Needless to say, the entire deposit was thoroughly drilled and samples were secured for determining its general value. However, since the composition varies in different parts of the quarry, and it is most essential for the manufacturer to have a uniform mixture of raw material, a thorough knowledge of the composition of the present and future quarry banks is nec-

*Abstract of paper presented at New York meeting, A. I. M. E.

essary for efficient quarry operation. To secure this information, series of churn drill holes are drilled well in advance of future requirements, and samples of cuttings are carefully taken every 5 ft. The location of each hole is plotted on a map, and to secure reasonably accurate information the sampling holes are spaced 50 ft. apart in rows perpendicular to the strike and the rows are spaced 200 ft. apart.

Blasting

Initial blasts are made with 4x16-in. 60% Du Pont quarry gelatine in the bottom of the holes and 4x16-in. 40% Du Pont Red Cross Extra for the upper charges. All charges are detonated with Cordeau-Bickford detonating fuse.

The plain cordeau is used for the trunk or main line, which is upon the surface extending from collar to collar of holes. The single countered is best adapted for use in smooth holes up to 30 or 40 ft. deep. For holes somewhat rough or fairly deep, double countered is recommended, and for deep jagged holes, where the lead tube is subject to considerable strain and bruising, the wire inserted double countered is probably the best.

Planning the Blast

At the Atlas quarry it has been found that the use of cordeau has saved much time in loading, especially where it is desirable to separate or break the charge in order to place the dynamite in the most advantageous places so that the best fragmentation may be secured. For example, a 46-hole blast, each hole 44 ft. deep, required but 4 hr. and 30 min. to clean the holes out, load, tamp and connect, with a crew of 14 men and a cart and driver for handling clay stemming. To load this blast the holes were first bailed dry, by means of a sand pump operated by a small air hoist mounted on a light three-wheeled truck to be sure that the powder could sink to the bottom of the hole. There were 23 holes in the front row and 23 in the back row. The front row was 18 ft. back and the back row 15 ft. behind that. The holes were 18 ft. apart along the row. In the bottom of each hole, 75 lb. of 60% 4x16-in. quarry gelatine was used; in the upper part, from 100 to 125 lb. of 40% 4x16-in. Red Cross ammonia powder. Charges were broken once or twice, depending on the bedding planes. There were 3450 lb. of 60% gelatine and 5000 lb. of 40% Red Cross; a total of 8450 lb. of explosives used, which blasted loose 45,540 tons of rock (5.38 tons per pound of explosives). For detonating, 2000 ft. of double-countered cordeau and 850 ft. of plain cordeau were required.

The procedure when using cordeau is as follows: The line of cordeau leading into the hole is secured to the first stick of dynamite and carefully lowered, after which the tamping dolly is used to see that it is firmly upon the bottom. Then the powder and stemming are put in and tamped as required until the hole is full. The cordeau is cut off about 6 in. above the collar. After all holes are loaded, the trunk line of plain cordeau is strung out over the protruding branch lines in the form of a loop with two free ends at the center of the front row of holes. The surface or trunk line is often connected, when one piece is not long enough, by special brass sleeve couplings made for that purpose. Short pieces are never used in the holes, left-overs being used for the trunk line. The ends of the branch line are split with a tool made especially for this purpose and joined to the trunk line by placing that line firmly into the crotch, then twisting the split ends, one to the right, the other to the left of the intersection. Care should be taken to have the lead tube of the trunk line firmly against the T.N.T. in the crotch of the branch line. Extreme caution must be taken to prevent moisture entering between the T.N.T. in the crotch and the trunk line, as a single drop of water may prevent detonation. If it should be necessary to connect during a rain, a covering should be used while connecting and the joints should be taped and covered. The paraffin paper from the dynamite boxes is often used for covering after connections are made, and a large delivery wagon umbrella makes an excellent portable shelter for the connecting operation. Care is taken to see that the branches leave the main line at right angles, at least for 3 or 4 in. Beyond that, easy curves do not harm, but sharp angles are never allowed to occur in main or branch lines. No. 8 electric exploders are attached to the two loose ends of the main line by means of the special sleeve couplings supplied for that purpose, and the shot is fired with a small blasting machine.

Secondary Drilling and Blasting

After the initial blasting there are some rocks too large for the crusher. These are "block holed" with Ingersoll-Rand B.C.R.430 Jackhamer and Waugh hammer drills, using hollow hexagonal drill steel with rose bits having six cutting edges. The rock is too soft for Carr or chisel bits; the use of these results in fitchered holes. Hammer-drill bits are sharpened with a Leyner bit sharpener, in the quarry blacksmith shop.

Block holes are loaded with 1¼-in. 30% Red Cross ammonia dynamite and detonated either with fuse or electric exploders. Electric exploders are preferred when there are many blasts to be shot at a time. A California bench crimper is used for cutting fuse and crimping caps. Fifteen drillers and blasters work an average of 10½ hours per day preparing the bank for loading.

Loading

Loading is accomplished by means of three Bucyrus 100-B electric shovels equipped with 2½-yd. Missabe-Vanderhoef dippers. After considerable study of the local conditions, the 100-B electrics were decided upon as being capable of meeting the daily requirements and standing up to the daily grind better than any smaller shovel. A larger shovel is not required, although at times the 100-B's have set aside boulders, for secondary blasting, weighing over 10 tons.

Efficiency of Operation

Although the dippers are only slightly larger than those formerly used on the railroad type steam shovels, there is a great increase in efficiency due to the saving of time required for "moving up," the greater loading range resulting in considerably less track work and fewer delays for secondary blasting, as well as a large saving of numerous other time losses attending steam shovels, such as handling coal and water, especially during winter. This increased efficiency has resulted in a large reduction of the total quarry labor and operating time of the shovels, locomotives and primary crushers.

The shovel crew consists of only two men, the operator and an assistant. The operator not only must load the cars as quickly as possible after they are "spotted," but he is held responsible for the mechanical condition of the machine he operates, although the maintenance foreman makes personal inspections and arranges with the general foreman or superintendent for a time to do the longer jobs. The assistant operators do the routine oiling, cleaning, etc., and attend to the clutches and power cable when moving up. When long moves are made, men from the track crew are used to assist. The assistant operators have been trained so that they are capable operators and act in that capacity when required.

Daily inspections of the electric equipment are made by a qualified electrician and all controllers and other equipment kept in first-class condition.

Safety Practices

In line with the policy of the company, many unusual precautions have been taken to prevent possible injury to workmen. The 2300-v. power lines are carried upon high, substantial poles throughout the quarry, giving ample clearance for the shovels and other equipment. The poles carrying the downcoming wires to the plug-in fused disconnecting switches are protected by circular metal fences, which can be moved easily when the switches are relocated. The cross arms carrying the switches are 10 ft. from the ground and standard approved switch sticks are used for throwing in and out the disconnects. These sticks are kept in the shovel, where they are protected from moisture and misplacement. Suitable warning signs are placed on the poles, also at any other places deemed advisable. Disconnects are so arranged that the power can be shut off the lines that lead to the different locations, and these are thrown out when the line is within range of flying rock.

Electrician's rubber gloves protected with

leather glove coverings and specially constructed wooden-handled hooks are kept in convenient places on each shovel, for use in handling the flexible power cable leading to the shovel. No person is allowed to handle this cable without using them. The gloves and the cable are periodically tested and any weak place is taken care of promptly.

Handling Electric Cable

The cable is kept off the ground as much as possible, by means of specially constructed standards, but when it must run under the track it is covered with a metal covering to protect it from hot cinders dropped by passing locomotives. A skip is drawn behind the shovel for all surplus cable. This surplus is laid in coils about 5 ft. dia. and pays out over a roller as the shovel advances. When moving back, a chain secured to the skip is hung over the dipper teeth, the skip drawn back and the cable coiled therein. This saves unnecessary wear of the rubber covering by dragging and the covered skip protects it from possible flying rock during blasting.

The three shovels are operated 10 hours per day to secure the required production of approximately 5000 tons. The loading time of these shovels is limited at present by the capacity of the primary crusher and the necessity of a mixture of cement rock in right proportions from different parts of the quarry. Two shovels are operated on the lower level and one on the upper level. Later the shovel on the upper level will be taken below and the top level will only be advanced as the face is reached below. There has been no effort to make any particular record run, although shovel reports show that a single shovel has loaded 2080 tons in 10 hours, including delays for shifting, oiling, inspection, etc. In a single hour one shovel has loaded 396 tons.

Plan of Development and Transportation

The track layout consists of a standard-gage railroad leading from the quarry faces, on two levels, to the primary crusher at the mill, a distance of approximately 4000 ft. A grade of 2.25% ascends from the lower level to the grade of the track leading from the upper level, where both converge and run as a main line to the crusher. In the lower level the track branches out to the right and left, one running parallel to one side face, one parallel to the other side face, and one leading ahead to the pilot cut. The pilot cut is advanced approximately 100 ft. wide, so that the two remaining sides may be removed by side slicing, thus giving two long faces where the shovels operating therein will have the obvious advantage of a long loading track. Since the upper level has been developed to such a great extent, a pilot cut is no longer necessary. Set-out tracks for loaded cars and empties are located as conveniently as possible, to reduce the loss of time for shifting. The permanent, or main line, tracks are of 80-lb. rails; the branches are of 60-lb. rails. Hard-center manganese frogs are used in all switches.

Hauling

The rock is loaded into side-dump cars, of 12 yd. capacity, manufactured by the Western Wheel Scraper Co. The newer ones are of all-steel construction. Sixty-two cars are in use. The loaded cars are set out on the storage tracks where they are made up into trains of 13 cars for delivery to the crusher. These trains have the desired apportion from each location, depending on the composition of the rock loaded by each shovel.

Steam locomotives of saddle-tank type, weighing 60,000 lb., are used for attending the shovels, one for each shovel. One steam locomotive weighing 144,000 lb., manufactured by the American Locomotive Co., is used for taking the 13-car trips to the crusher and bringing the empty cars back. A trip from the crusher to the quarry and return requires about 25 minutes, less time than it takes to crush a train of rock. The shovel locomotive crew consists of four men —engineer, fireman, brakeman and helper. The main haulage crew consists of five men —engineer, fireman, conductor and two brakemen. The crews work ½ hour longer than the shovels, in order to prepare the locomotives for the day's service. The trackmen and a foreman maintain the tracks and do the necessary track shifting. They work an average of 9 hours per day.

Drainage

The upper and lower levels drain into a large sump located at the foot of the slope in the lower level. This sump has a capacity of approximately 500,000 gal. At one end of the sump is a pump house, steel frame covered with corrugated iron, equipped with three Gould single-stage, double-suction, centrifugal pumps, 10-in. suction and 8-in. discharge, of 2000 g.p.m. capacity. Each pump is mounted on a single metal base with a direct-connected 100-hp. motor. There is also one smaller centrifugal pump with a capacity of 1000 g.p.m. All pumps are installed on concrete foundations, 3 ft. above the quarry floor, and are so arranged that the suctions are housed in to the low-water line, so as to prevent trouble from ice. In addition to the screened foot valves, a ¼-in. mesh galvanized wire screen is put from the housing to the bottom of the sump to prevent foreign matter entering the pumps. All discharges are connected to a header and the water is then elevated 40 ft. through a 16-in. dia. pipe, thence to a creek through approximately 1200 ft. of 16-in. universal-joint cast-iron pipe. During the day shift a quarry foreman starts and stops the pumps as required, while at night one man, who also acts as a watchman, attends to the pumping.

Crushing

The cement rock is delivered to a 36x60-in. Fairmount type single-roll crusher driven by a 250-hp. motor. Capacity of this crusher varies considerably with the size and hardness of material. Its average capacity at this plant is 500 tons per hour. The trains of 13 cars are spotted on a track, with the first car at the side of the hopper paralleling the axis of the roll. The tail track above the crusher house and the track for empties below has a grade of 0.5%. A wire rope, 1⅛-in. dia., leading from a 4-ft. hoist drum at the crusher house, is secured to the last car after passing around a sheave at the upper end of the grade, and the train is then lowered by gravity. This frees the locomotive so that it may return to the quarry with the cars previously dumped. A small motor is used to furnish power for winding up the cable after the cars have been lowered to a track below the crusher house. A 19-in. dia. air cylinder equipped with a trunnion for tilting, a piston and rod with a hook on the end, is used for dumping and pulling the car beds back into place. After the loaded car is spotted the cylinder is tilted so that the hook goes over a shaft secured to each car body by means of a specially designed casting. Air pressure is then applied by the operator, through a three-way valve, the car body holding chains unfastened and the cars dumped at the will of the operator. With this equipment, costly dumping devices, with the attendant maintenance requirements on each car, are needless. To break occasional chokes caused by stones arching in the hopper, a heavy steel hook secured to a cable is used. This is raised and lowered by an air-driven piston operated by valves at the crusher platform. Three men attend to the spotting, dumping and crushing.

The product of the Fairmount crusher (maximum size, 10 in.) is conveyed on a 42-in. rubber conveyor belt to a chute where the stream is split and delivered to two type SXT-11 Pennsylvania hammer mills, which reduce it to 1½-in. and under. Each mill is direct-connected to a 400-hp. motor.

From the hammer mills the crusher rock is conveyed on a 42-in. belt to a Robins tripper, which distributes it in a storage of 20,000 tons capacity. A small amount of high-grade limestone used for balancing the composition is also stored at this point. This limestone is quarried and crushed at Pine Island, N. Y., where a modern and efficient operation is carried on, with a daily output of approximately 500 tons. A Marion electric shovel, model 37, full revolving on caterpillars, is used for loading and a gasoline locomotive is used for haulage.

Marbletex Co. to Open Plant at Lima, Ohio

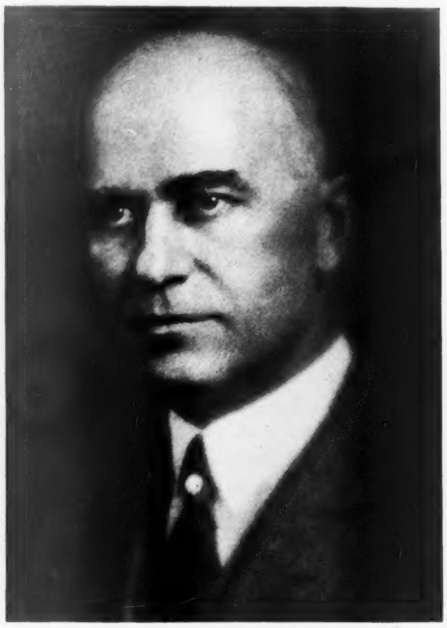
According to recent reports, the Marbletex Co. of Chicago is contemplating the establishment of a plant in Lima, Ohio. The company is a producer of imitation marble products by a secret process. H. A. Walter is president.—*Toledo* (Ohio) *News.*

Cement, Aggregates, Pre-Mixed Concrete Discussed at Convention

American Concrete Institute Proceedings at New Orleans of Importance to Concrete Materials Industry

VARIOUS ITEMS of interest and importance to manufacturers of cement and producers of aggregates were discussed at the New Orleans convention of the American Concrete Institute, February 11-13; although as usual most of the papers, reports and discussion dealt more with design and construction.

Duff A. Abrams, long the head of the research laboratory of the Portland Cement Association, and now the head of the research laboratory of the International Cement Corp., New York City, was installed as president of the Institute for the ensuing year, succeeding E. D. Boyer, of the Universal-Atlas Cement Co. A. R. Lord, consulting engineer, Chicago, Ill., was elected vice-president; Harvey Whipple, Detroit, Mich., was re-elected secretary-treasurer. The 1931 convention will be held in Milwaukee, Wis.



Duff A. Abrams, new president, American Concrete Institute

Portland Cement

Probably the most interesting discussion of portland cement was in the report of **P. H. Bates,** United States Bureau of Standards, as chairman of the Institute's committee on cement. Mr. Bates said in part: "It is felt that the discussion will dispel the erroneous idea that there is such a thing as a standard portland cement. It is true that all manufacturers of the commodity make an especial effort to have it pass a certain set of standard requirements, but in so doing it has resulted that not only does the product of the majority of mills meet these at all times but the product may exceed these requirements to various degrees at any time. It is further believed that this discussion may serve to indicate that portland cement does develop other properties than those of hardening and acquiring strength. It is hoped that it will be made clear that some properties, as volume changes and heat developed during the reaction with water, may be so paramount in special cases as practically to force the ignoring of strength.

"Finally it is believed that this discussion will have served its most useful purpose if the importance of certain properties and the meagerness of data covering them are so sufficiently impressed upon even a very few readers that they will originate an intensive study to fill up the outstanding gaps in our incomplete knowledge of cement.

"The interest in early strength is too recent to permit of there being many published data available. Three years ago few were making any tests of other than neat tensile briquettes at ages earlier than 7 days. Then the efforts of some portland cement manufacturers to manipulate the making of their product so that it might come into the class of the high alumina cements, so far as high early strength was concerned, led to the breaking of test specimens after aging two or three days. But in the great majority of cases such testing has been confined to the making and breaking of tensile briquettes so that essentially there are few data available."

Cement Variations Affect Concrete Properties

Mr. Bates called attention to the lack of data on late strength—strength of cement products over five years' old, because cement in past investigations has seldom been recognized as a variable. He pointed out how variations in the cement must affect permeability, proportioning and workability. As to workability he said in part: "At the present time the term 'workability' is very much to the fore in discussions of cements and concretes. Since this term is used to describe that condition of mortars or concretes under which they can be readily worked into forms or around reinforcing without segregation, it can be appreciated that it is a matter of much concern. This is particularly true since it is now so thoroughly realized that attempts to secure this property through the agency of increased amounts of water result only in lower strengths and increased likelihood of segregation. Furthermore, the increased demand for high testing, so-called 'plastic' mortars and the increased use of concrete prepared at central mixing plants and hauled considerable distances before placing, has still further emphasized the workable properties of such materials. Finally the matter is brought to a climax by sales propaganda featuring the properties of certain agents reputed to develop workability when added to mortars or concretes."

Tests Should Decide Cement Claims

The short-comings of much previous investigation of workability was pointed out. He concluded that it is evident that, since cements are now being sold on the basis that they are more "plastic" or will produce more "workable" plastic products than others, it will be necessary to devise apparatus to determine not only whether the cements, as pastes, are as advertised but also whether they produce the quality claimed for them in mortars and concretes.

Mr. Bates then discussed the staining or non-staining properties of cement, shrinkage and plastic yield, chemical heat of setting in large masses, reactions to curing conditions and color as cement variables. In conclusion he said:

More Study Needed on Cements

"This paper has been developed along the general lines suggested to the committee. It is at some fault in not showing in all cases that different brands of standard portland cement have different physical properties or react differently under various conditions of service. But this fault is due to the lack of data in some cases which would support such a thought. This lack of data in turn is due to the assumption that all brands will at all times be similar in every respect. Hence, in investigative work in which cement might have properly been considered a variable, it was assumed to be a constant. In this paper an effort has therefore been made to show that it would have been just as logical to have assumed that various cements might at any time have different physical properties.

The various properties of concretes have as a consequence been considered in the light of the fact that these properties may be materially affected by the character of the cement. The urgency of studying all the properties of concrete as resulting in a major degree from the quality of the cement is stressed. There can be no constituent of concrete more worthy of study than the cement—without it there is no portland cement concrete—yet as an essential constituent of concrete it has been studied less than any of the other components."

Compounds in Cement

Thaddeus Merriman (New York Board of Water Supply), discussing Mr. Bates' report, said in part: "The time is close at hand when we must put aside the conceptions of cement compounds which have been our guide for some years past. These concepts may ultimately be developed and become of value, but for the present they are not even useful as symbols for pointing the way to progress. Tri-calcium silicate and di-calcium silicate have been the passwords in a large part of the literature on portland cement, yet the existence of these compounds in the cement of commerce has never been conclusively demonstrated. Theoretically it would be of value to know the compounds which are present, but practically it makes little difference. We may just as well, for the purpose of discussing the problem, assume that all cement contains four types of compounds and describe each by the characteristics it develops in concrete rather than by its chemical formula. Thus, the existence of the following compounds may be predicated:

Type A—Makes durable and resistant concrete of high strength. Its constituents are closely and intimately combined.

Type B—Makes strong concrete but develops laitance and tends to disintegrate. Its constituents are indifferently combined.

Type C—Makes concrete of fair strength which disintegrates easily. Its constituents are loosely combined and it develops much laitance.

Type D—Develops no strength in concrete and readily disintegrates. Its constituents are only barely combined and it acts merely as an adulterant which makes much laitance.

Select Cement Best Suited for Work

"Each of these types may be further divided, but the four enumerated serve to illustrate the principle that all portland cement is a mixture of a number of types of compounds. The proportions of the several types vary in different cements from different mills and often from hour to hour in the same mill. One cement consisting larges of Types A and B is an excellent product. Another contains a little of each of Types A and D and much of Types B and C. It is a medium cement which tends to disintegrate on exposure. A third cement may consist of Types B, C and D, with C predominating; it will show good strength but will quickly disintegrate and will show much laitance. All of these three assumed combinations will pass the usual specification requirements. They sell at the same price yet they are not of equal value in the concrete they produce. The great need of the engineer is for a test which will enable him to select that cement which is best suited to his work. Such a test, however, will not come to be recognized until both producer and consumer understand that portland cement as produced in the rotary kiln is not a fixed and definite compound, but is, in fact, subject to many variations which, ofttimes, are of great magnitude and are not disclosed by a specification which merely calls for a minimum strength. Under such a specification low grade products are hall-marked as equal to the best. In no other field of material used in engineering structures does such a condition obtain."

Most of the discussion on the floor of the convention had to do with variations due to methods of testing, the personal equation, etc.

Concrete Aggregates

There were no papers, reports or discussions on aggregates as such, but a number of the papers contained items of interest 'n connection with aggregates.

I. E. Burks (Alcoa Power Co., Kenogami, Que.), in a paper on "Concreting Methods at the Chute a Caron Dam," described a pre-mixed plant and methods of placing concrete in 40 deg. below zero weather. This company produced its own sand and crushed-stone aggregates. The crushed-stone plant has an 84x66-in. Allis-Chalmers jaw crusher. This machine will take a 48-in. rock and turn out a 14-in. product. The secondary crusher is a No. 15-N Allis-Chalmers gyratory type; the feed is 14-in. and the product 6-in. There are four Allis-Chalmers 6-N gyratory crushers which reduce the 6-in. stone to 3-in. when required for Class B concrete. The product of the secondary crusher is passed through a pair of revolving screens having 2-in. circular openings which remove and waste all material smaller than 2-in. The coarse aggregate is graded from 2-in. to 6-in.

Better to Leave Out Small Sizes

By means of laboratory experiments and actual field tests it was found that coarse aggregate of this gradation will produce better concrete for less money than a uniformly graded aggregate, for the following reasons, according to Mr. Burks:

"(*a*) A greater quantity of coarse aggregate can be added to a fixed amount of mortar and still produce a workable mass than is possible with aggregate of 'ideal' gradation. This amounts to a reduction of unit cement content, which means more economical concrete.

"(*b*) It was found that any coarse aggregate ideally graded from ½ in. to 6 in. shows a pronounced tendency toward segregation and grouping of sizes. This is especially noticeable in a 2-yd. or larger mixer. This grouping of sizes tends to harshen the mixture and interferes with workability. If the mortar content is concreased until the mass becomes workable, it amounts to roughly 125% of the voids in the stone.

"(*c*) Unless the ideally graded coarse aggregate is separated into two or three sizes and then re-combined in the proper proportions there is a very noticeable separation of sizes, or raveling, in the storage bins. This feature becomes quite troublesome due to the wide variation in gradation from batch to batch. With the smaller sizes removed, the raveling is reduced to a minimum and the workability and quality of the concrete becomes more nearly uniform.

"(*d*) In aggregate graded from 2 in. to 6 in., a mortar content equal to about 110% of the voids in the stone will produce a workable concrete."

While the maximum size of coarse aggregate used on this job (6-in.) is larger than on ordinary work, Mr. Burks expressed the opinion that the same principles apply to smaller sizes: that is, there will be better workability where the small sizes are omitted. He thought there should be no coarse aggregate finer than ⅓ to ¼ the maximum size. In his case, in order to have workability it was economy to waste everything below 2-in., which amounted to 12 to 15% of the crushing plant output.

Light-Weight Aggregates

In the program of the National Concrete Products Association, preceding that of the American Concrete Institute, great stress was laid on the gains made in the last year or two in the use of burned shale aggregates for cement products, city building floors, walls, etc., and for bridge floors. There are now nine "Haydite" plants in operation in the United States and Canada making burned-shale aggregate in rotary kilns. These producers have their own association—the Haydite Manufacturers' Association—and are actively engaged in advertising and promotional work.

Pre-Mixed Concrete

Two papers and considerable discussion had to do with centrally-mixed, or pre-mixed, concrete. **Miles N. Claire** (Thompson-Lichtner Co., Boston, Mass.), whose article in Rock Products, November 9, 1929, on the plant of the Boston Concrete Co., will be recalled, reported proposed specifications for ready-mixed concrete covering both concrete made at a central plant and that mixed in transit. The following clauses on delivery are of particular interest:

"(*a*) The organization supplying concrete shall have sufficient plant capacity and transportation apparatus to insure continuous delivery at the rate required.

"(*b*) The interval between batches for a pour shall not exceed 30 minutes or in any case be so great as to allow the concrete in place to partially harden.

"(c) The methods of delivering the concrete shall be such as will facilitate placing with the minimum of rehandling and without damage to the structure or concrete."

Definite Qualities Desirable

Discussing the proposed specifications, Mr. Claire said in part: "The usual specifications for concrete, because of the necessity of allowing for many factors when concrete is made on the ordinary job, rightfully contain many restrictions on the quantities of materials and the water content. All that the engineer wants, however, is concrete of a definite quality as determined by the strength and the workability. If the full advantage is to be realized from the development of the commercial concrete plant, the specifications must require the use of superior equipment and proper control at the commercial concrete plant, and then allow the plant to meet the requirements of quality without restriction as to the quantities used in the mix. The proposed tentative specifications were written with this idea in mind, and although such a specification may be considered premature, it is certainly a logical step forward.

Testing Pre-Mixed Concrete

"The conditions surrounding the production of ready-mixed concrete are ideal for the use of proportions based on tests of the materials. The conditions surrounding the production of concrete on the ordinary job make it almost necessary to use established results for average materials. The commercial concrete organization must have available sufficient data from tests made by a reputable concrete testing engineer to enable the architect or engineer to determine that the quantities used will give the quality of concrete desired. Additional tests should be made by a competent testing engineer as a check on the quality of the concrete placed. This work should be done at the expense of the concrete producing organization, who should receive copies of the test reports for their own use.

"The only part of the commercial ready-mixed concrete operation which differs greatly from the ordinary job concreting procedure is that which has to do with the mixing and placing of the concrete. Ready-mixed concrete is essentially fabricated at such distances from the point of deposit as to require the use of vehicles other than barrows, buggies or chutes for its transportation. The elements of time (one hour maximum) is thus introduced into our consideration of the factors affecting the quality of the concrete from ready-mixed concrete plants.

Proper Servicing Necessary

"Proper servicing of the job is obviously necessary, and this means proper plant design so that no serious delay can occur due either to plant or material supply failure. The ideal condition would be for each organization to have several plants, or to have close co-operation between competing plants.

"Architects and engineers are looking forward to the time when they can specify a given quality of concrete, and be as sure of getting it, with only nominal inspection, as they now are when they specify a given grade of steel. It may not be long before we have commercial concrete organizations furnishing concrete 'erected' just as steel organizations supply and erect steel today. It is hoped that this report and the subsequent work of the committee will help to promote such progress in the field of concrete construction."

Most of the discussion of those who make or have used ready-mixed concrete showed that it was possible to do these very things —actually guarantee the concrete—if the proportioning of the mix were left to the concrete manufacturer. The discussion brought out that there are about 150 commercial ready-mixed plants in operation today.

The report of the session on concrete products appears elsewhere in the "Cement Products" section of this issue.

Mine Rescue Training

THE BUREAU of Mines now has ready for distribution, Miners' Circular 33, "Advanced Mine Rescue Training." This publication is the first of a series of four miners' circulars designed for use in a course of training that will prepare mine officials to organize men for rescue and recovery work. This part discusses the character and occurrence of mine gases and mixtures of gases. Detection of gases is so important that the various methods are treated at length. Particular attention is given to the flame safety lamp, the Burrell methane indicator, the carbon monoxide detector and the pyrotannic indicator. Part II (Miners' Circular 34) gives instructions in the collection of air samples and the use of the Bureau of Mines Orsat apparatus for analyzing air samples; Part III (Miners' Circular 35) describes the methods and equipment used in protection against mine gases, and Part IV (Miners' Circular 36) explains the procedure in sealing and unsealing mine fires and in recovery operations.

Construction Supplement

THE *United States Construction Magazine* is now being published fortnightly as a special section of the *United States Daily.* Each issue will contain a number of articles by foremost authorities on home building, general construction, city planning, materials of construction—types, uses and specifications and other pertinent topics. The current issue, for example, has an interesting story concerning gypsum by R. M. Santmyers of the U. S. Bureau of Mines.

Florida Rock Proves Suitable for Concrete Aggregate

THE SOFT native limestone of Florida has been definitely established as a permissible concrete aggregate, according to H. R. Albion, district engineer, Portland Cement Association, writing in a current issue of *Engineering News-Record.* This material, because of long-standing and standard requirements as to hardness and wearing in aggregate, formerly could not qualify. But since steel-tired vehicles and tire chains are not used in Florida, these requirements have lost their force. Further, the higher porosity of the native rock is not objectionable because of little frost action in Florida. Several noteworthy examples of concrete roads, sea walls and structures have demonstrated that the soft Florida rock could be used successfully.

Probably the greatest contribution to the use of Florida rock was B. M. Duncan's (Florida state highway engineer) discovery relating to aggregate size. The rock in the Miami territory has a popcorn appearance containing holes filled with sand or marl, or both. Using the ordinary sizes of coarse aggregate, from ¼- to 2½-in., tests of compression cylinders showed no satisfactory or uniform results. The larger aggregate pieces seemed responsible for this, for the cylinders always broke through them and through the marl-filled cavities. Mr. Duncan found that crushing the stone to a smaller maximum size remedied the trouble. In crushing, the marl-filled pockets were broken up and the rock structure was such that a 1-in. maximum size would yield a product free from weak spots and very uniform in quality. This formed the basis for a new specification, and use was made of it in the designed mix for all the paving.

At the same time rock producers in Hernando county, in the Tampa area on the west coast, were working along somewhat different lines but with the same object in view. They were operating big plants that produced considerable tonnage. Better preparation of a more uniform product appeared to be their greatest need, next to convincing Florida users that their stone was suitable generally for all concrete purposes. The local plants now market their products quite generally for all classes of construction, and they are accepted as wholly satisfactory under the specifications governing their use. Aggregate preparation is uniform and standardized to a large degree.

With the work of the various interested engineers and producers more or less unrelated and independent, co-ordination of effort seemed desirable and advisable, so an aggregate survey of the entire state was made and a series of tests followed. Such tests covered typical commercial production of both fine and coarse aggregates in Florida. The results confirm all that had been done and all that had been expected.

To Build 2,000 Barrel Cement Plant in Mexico

ACCORDING to G. H. E. Vivian, managing director of the La Tolteca, Compania de Cemento Portland, S. A., that company expects to start construction on a new 2000-bbl. per day cement mill near Mexico, D. F., Mexico, within a few months. The Tolteca company has been operating a mill of this capacity at Tolteca for the past 20 years and this plant will be shut down and completely modernized after the new mill is running.

The Tolteca company expects to effect economies in manufacture and with its two mills lower the price of cement in Mexico considerably, thus stimulating its use. The greatest factor is the high cost of fuel, $3 per bbl. for fuel oil and $12 per ton for coal. At present, the company is supplying about 40% of the domestic consumption, Mr. Vivian states, with the remaining 60% divided between the four other cement mills in Mexico.

Alpha Portland Installs New Waste Heat Generator

INSTALLATION of a 10,000-kw. turbine-generator, the largest single unit operating on waste heat in the world, is under way at the Martin's Creek, Penn., plant, Alpha Portland Cement Co. The turbine generator, supplied by the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., will generate sufficient electricity to operate and light the entire mill.

Northwestern States Employes Form "20-Year" Club

MORE than 200 persons were in attendance at the recent annual banquet of the employes of the Northwestern States Portland Cement Co., Mason City, Iowa, which was designed to honor the group of 18 employes who have served continuously with the company for 20 years or more. The "20-Year" club came formally into being and in token of the distinction a gold charm bearing the name of the bearer and a suitable inscription was presented by Col. Hanford MacNider, president of the company, to each of the members.

Oldest in point of service and first to receive the charm was Fred Smith, plant superintendent, who has been with the company from the first. Others honored included: L. S. Atkinson, foreman, 1906; A. M. Ikenberry, master mechanic, 1907; W. J. Birch, timekeeper, 1907; H. S. Severs, watchman, 1907; Oro L. Pringle, foreman, 1907; Charles J. Keel, yard employe, 1907; Sidney Birch, foreman, 1908; M. E. Richardson, foreman, 1908; B. B. Jones, foreman, 1908; Henry Sims, power house employe, 1908; T. H. Stetler, storekeeper, 1908; Martin Peterson, engineer, 1908; J. F. Lynch, salesman, 1908; P. A. Danielson, salesman, 1908; R. H. Meyer, engineer, 1909; W. C. Thompson, engineer, 1909; J. E. Meyer, salesman, 1909.

The records show 24 men to have been with the company for 15 to 20 years and 41 others from 10 to 15 years.

In assuming the position of president and active head of the company, an office he was recently elected to, Colonel MacNider in a brief address outlining policies announced that there was soon to be worked out a plan which would enable employes wishing to do so to procure stock in the company on an installment basis. — *Mason City* (Iowa) *Globe.*

Vermont Granite Merger

A MERGER involving more than $6,000,000 of granite realty was completed recently at Barre, Vt., when the Rock of Ages Corp., largest owner of granite quarries in the world, and 10 manufacturing concerns were combined. The new organization will operate under the Rock of Ages Corp., with administrative and operating headquarters and offices at Barre and in Graniteville, Vt. —*New York* (N. Y.) *Herald-Tribune.*

Would Convert Old Bluffton Quarry Into Fishing Reservoir

PROPOSAL to transform the abandoned quarry of the National Lime and Stone Co. at Bluffton, Ohio, into a state fishing reservoir has been made by Harry Shalley, Bluffton, member of the Tri-County Fish Stocking and Pollution Association. Shalley has already conferred with state officials regarding the project. Water in the old quarry covers 27 acres. The proposal is expected to materialize into a community project.

The quarry considered for the reservoir was abandoned by the National company early last fall following a $200,000 fire that totally destroyed the main plant building of Bluffton holdings. The 27-acre quarry has been gradually filling with water since that time.—*Lima* (Ohio) *News.*

F. H. Smith Broadcasts Tribute to Cement

GUEST speaker of the Westinghouse Electric and Manufacturing Co., Frank H. Smith, president of the Portland Cement Association, gave an interesting little talk on the services and utility of cement, during the Westinghouse company's recent broadcast, "Salute to the Cement Industry." The advancement in concrete design and structures formed the basis of Mr. Smith's remarks. Furthered uses of concrete had made the United States the largest cement consumer in the entire world, he said.

Mount Company to Build Lime and Dry Ice Plant

MOUNT Lime and Chemical Corp., Lynchburg, Va., is reported to be planning the erection of a lime and dry ice plant near Natural Bridge of Virginia, to produce 120 tons lime and 100 tons dry ice daily. The company owns 375 acres and is said to have completed prospecting a large deposit of stone. W. D. Mount is president.

Tennessee Copper to Expand Florida Phosphate Properties

EXPANSION of the superphosphate and gypsum manufacturing plant at Tampa, Fla., of the Tennessee Copper and Chemical Corp. of Copperhill, Tenn., now under way, is considered one of the most important developments in the history of the company. The Tampa plant not only produces triple superphosphate which is widely used by other manufacturers of mixed fertilizers and in the company's own plants, but it produces ordinary superphosphate which is supplied to fertilizer manufacturers in Florida, Cuba and in ports along the Gulf of Mexico. The plant had a successful year's operation in 1929, but is capable of increased production and this increase may follow the completion of a ship canal now being dug.

Gypsum is recovered as a by-product of the manufacture of phosphoric acid, which enters into the manufacture of triple superphosphate, and much of it is being sold from the Tampa plant for building purposes. Later still other products are expected to be marketed from this plant. The company owns large deposits of phosphate rock within a short freight haul of its Tampa plant and there is also available from other nearby producers an almost unlimited tonnage. It owns a number of manufacturing sites along the side of the basin on which its own docks are located, and it is thought other industries may soon make use of them.—*Manufacturers Record.*

All Officers Re-Elected by Dolese and Shepard Co.

AT the largest annual meeting ever held by the Dolese and Shepard Co., Chicago, the following were elected directors of the company: K. K. Knapp, W. Irving Osborne, Fred W. Smith, Edward R. Hills, William Roy Carney, E. A. Engler, O. P. Chamberlain, F. B. Downing and H. H. Hiland. There were present and voted, either in person or by proxy, 18,752 shares of capital stock out of the total issue of 19,148 shares.

At the directors' meeting held immediately after the annual meeting of the stockholders, the present sitting officers were re-elected. They are as follows: Col. O. P. Chamberlain, president; W. R. Carney, vice-president; E.R. Hills, secretary; W.J. Stoffel, treasurer.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Jan. 25	Feb. 1	Sand, Stone and Gravel Week ended Jan. 25	Feb. 1
Eastern	1,949	1,991	1,293	1,607
Allegheny	2,223	2,107	1,981	2,262
Pocahontas	161	113	397	404
Southern	473	412	4,718	4,243
Northwestern	418	483	471	654
Central Western	422	481	4,289	4,096
Southwestern	192	319	1,584	2,820
Total	5,838	5,906	14,733	16,086

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1929 AND 1930

District	Limestone Flux 1929 Period to date Feb. 2	1930 Feb. 1	Sand, Stone and Gravel 1929 Period to date Feb. 2	1930 Feb. 1
Eastern	10,176	8,988	8,252	7,610
Allegheny	12,979	10,484	8,998	10,658
Pocahontas	547	866	1,488	2,229
Southern	2,184	2,418	31,781	25,669
Northwestern	2,325	1,921	2,850	3,613
Central Western	2,107	2,067	23,515	19,933
Southwestern	1,859	1,382	21,604	13,941
Total	32,177	28,126	98,488	83,653

COMPARATIVE TOTAL LOADINGS, 1929 AND 1930

	1929	***1930***
Limestone flux	***32,177***	***28,126***
Sand, stone, gravel	***98,488***	***83,653***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning February 22:

CENTRAL FREIGHT ASSOCIATION DOCKET

23962. To establish on **sand and gravel**, carloads (See Note 3), from Terre Haute, Ind., to Switz City, Ind., rate of 90c per net ton. Present rate, 11½c.

23074. To establish on **sand and gravel**, carloads (See Note 3), from Milford, Ind., to points in Indiana and Michigan, rates as shown below. Proposed rates in cents per net ton:

From Milford, Ind., to Grand Trunk Ry. stations (Via Granger, Ind.)

	Prop.		Prop.
Stillwell, Ind.	97	Gassopolis, Mich.	92
Mill Creek, Ind.	92	Penn, Mich.	92
Crumstown, Ind.	92	Wakele, Mich.	97
South Bend, Ind.	87	Marcellus, Mich.	97
Mishawaka, Ind.	85	Chamberlains, Mich.	107
Edwardsburg, Mich.	85	Schoolcraft, Mich.	107

Present rates, sixth class.

23984. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel**, carloads (See Note 3), from Vincennes, Ind., to Linton, Ind., rate of 70c per net ton. Present rate, 76c per net ton.

23988. To establish on **crushed stone**, carloads, Greenfield, O., to Charleston group stations as follows:

Owens, W. Va.	Elk, W. Va.
South Ruffner, W. Va.	South Charleston, W. Va.
Charleston, W. Va.	

And to hold same as maximum at the following intermediate stations:

Westmoreland, W. Va.	Culloden, W. Va.
Huntington, W. Va.	Lewis, W. Va.
Wilson, W. Va.	St. Albans, W. Va.
Barboursville, W. Va.	Spring Hill, W. Va.
Milton, W. Va.	

Present rates—To Westmoreland, Huntington, Wilson, Barboursville and Milton, W. Va., 140c; to Culloden, Lewis, St. Albans and Spring Hill, W. Va., 160c, and to Charleston, W. Va., 175c per net ton.

23990. To establish on **sand** (all kinds) and gravel, carloads, from North Canton, O., to Akron, O., rate of 60c per ton of 2000 lb. Present rate, 80c per ton of 2000 lb.

24020. To establish on **sand and gravel**, carloads, from Fairview and Swanville, Penn., to Union City and Corry, Penn., rate of $1 per net ton. Present rate, 80c per net ton.

24021. To establish on **molding sand**, carloads (See Note 1), from Bowes, Ill., to Muncie, Ind., rate of $2.27 per ton. Present rate, 21½c.

24028. To establish on **stone, crushed**, and **stone screenings**, in bulk, in open-top cars, in straight or mixed carloads, from Kenneth, Ind., to P. R. R. destinations in Indiana, rates as shown below.

Present and proposed rates from Kenneth, Ind., to P. R. R. destinations in Indiana.

	Pres.	Prop.		Pres.	Prop.
Marion	80	75	Hartford City	88	85
Bethevan	88	75	Mill Grove	95	85
Gas City	88	80	Dunkirk	95	90
Upland	88	80	Red Key	95	90
Renner	88	85	Powers	95	95

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

24029. To establish on **crushed stone**, carloads, from Thrifton, O., to stations in Ohio on the N. & W. Ry. rates as shown below. Present and proposed rates to N. & W. Ry. stations from Thrifton, O.:

	Pres.	Prop.		Pres.	Prop.
E. Danville	100	17	Winchester	110	17
Taylorsville	100	17	Seaman	110	17
Mowrystown	100	17	Lawshe	110	16
Sardinia	100	17	Peebles	110	16
Macon	100	17	Mt. Oreb	100	17

24030. To establish on **crushed stone**, carloads, from Thrifton, O., to Marietta, O., rate of $1.20 per net ton. Present rate, 17c.

24034. To establish on **agricultural limestone**, in box cars, carloads, minimum weight 50,000 lb., from McVittys, O., to Clarksburg, W. Va., rate of $2.42 per net ton. Present rate, 23½c.

24051. To establish rate of 70c per ton of 2000 lb. on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **or gravel**, carloads, from Harbor Bridge, New Castle and West Middlesex, Penn., to points on the Erie R. R. Co. shown below. Mileages shown are via Erie R. R. direct or P. & L. E. R. R. and Erie R. R.

From New Castle, Penn.

To	Prop.	To	Prop.
Sharon, Penn.	70c	Youngstown, O.	70c
Hubbard, O.	70c	Girard, O.	70c
Doughton's, O.	70c	Niles, O.	70c

From Harbor Bridge, Penn.

To	Prop.	To	Prop.
Hubbard, O.	70c	Girard, O.	70c
Doughton's, O.	70c	Niles, O.	70c
Yougstown, O.	70c		

From West Middlesex, Penn.

To	Prop.	To	Prop.
Youngstown, O.	70c	Niles, O.	70c
Girard, O.	70c		

Present rate is 60c per ton of 2000 lb.

24072. To establish on **stone**, viz., waste or tailings, carloads (See Note 1), except when car is loaded to full cubical or visible capacity actual weight will apply, from Sibley, Mich., to Coldwater, Mich., rate of 85c per net ton. Present rate, 16c.

TRUNK LINE ASSOCIATION DOCKET

22866. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads, **and/or gravel**, carloads (See Note 2), from Newport, Del., to Jersey City, Bayonne, Harrison, Rahway and Phillipsburg, N. J., $1.75 per net ton. Present rate, $2.05 per net ton. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

22867. **Limestone, ground or pulverized, and stone dust**, carloads, minimum weight 50,000 lb., from Jamesville, N. Y., to Keplers Mills, Belfast, Freemansburg, Orwigsburg, Pottsville, Mt. Carmel, Penn., 13c, and Tannery, Penn., 12c per 100 lb. Reason—Proposed rates are comparable with rates from Jordanville, N. Y.

22877. To revise the rates on **glass sand**, carloads (See Note 2), from Triplett, Va., to stations on the B. & O. R. R. and Monongahela Ry., Bellaire, O., Brownsville, Penn., Clarksburg, W. Va., Morgantown, Parkersburg, St. Mary's, Wheeling, Williamstown, W. Va., Connellsville, Masontown, Pittsburgh, Uniontown, Penn., and various. Rates ranging from $1.95 to $2.10 per net ton. Reason—Proposed rates are fairly comparable with rates from Berkeley Springs, W. Va., to same points of destination.

22878. **Crushed stone**, carloads (See Note 2), from Jamesville and Rock Cut, N. Y., to Scranton, Penn., $1.65 per net ton. (Present rates, $1.75 per net ton.) Reason—Proposed rate is comparable with rates on like commodities from and to points in the same general territory.

22887. **Limestone**, viz., crude, fluxing, foundry and furnace, when shipped in open-top equipment, carloads (See Note 2), from Stephens City, Va., to Monessen, Penn., $1.76 per gross ton. (Present rate, sixth class.) Reason—Proposed rate is comparable with rates on like commodities from and to points in the same general territory.

22890. **Building sand**, carloads (See Note 2), from Burnham, Penn., to following Pennsylvania points:

To	Prop.	Pres.	To	Prop.	Pres.
Millerstown	90	......	Chester	165	230
New Cumberland	115	......	Newport	90	......
Berwick	140	......	Beavertown	80	......
Philadelphia	165	230	Dauphin	105	115
Eddystone	165	......	Millersburg	125	......
Darby	165	......	W. Nanticoke	135	......
Lytle	145	......	York	125	140
Williamst'n	125	......	Milton	115	......
Coatesville	160	......	Naginey	65	105

Rates in cents per 2000 lb.

Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

22601. (A) **Sand, building**, carloads; (B) **sand, blast, engine, foundry, molding, glass, silica, quartz or silex**, carloads (See Note 2), from Hancock-Berkeley Springs district to Solvay, N. Y. (A) $2.70, and (B) $3.10 per net ton.

22892. **Ganister stone**, carloads (See Note 2), from Madley, Penn., to Sparrows Point, Md., $2.90 per net ton. Present rate, 24½c per 100 lb., sixth class. Reason—Proposed rate is comparable with rates from Paddy Mountain, Wolfsburg and Johnstown, Penn., to Sparrows Point, Md.

22921. **Sand** (other than blast, engine, foundry, glass, molding or silica) **and gravel**, carloads (See Note 2), from Mt. Bethel, Portland and Stier, Penn., to Blairstown and Hainesburg, N. J., 75c per net ton. (Present rate, $1 per net ton.) Reason—Proposed rate compares favorably with rates to Strasburg, Penn.

22925. **Fire and ganister stone**, carloads (See Note 2), from Cumberland, Md., to Bellaire, Bridgeport, O., Farrell, Penn., Girard, O., Greenville, Penn., Lowellville, Martin's Ferry, Mingo Jct., O., New Castle, Penn., Niles, O., Sharon, Sharpsville, Shenango, Penn., Steubenville, Struthers, Warren, O., Middlesex, Wheatland, Penn., and Youngstown, O., 9½c per 100 lb., and Springfield, O., 19c per 100 lb. Reason—Proposed rates are comparable with rates from Madley, Penn.

22512. **Crude dolomite**, carloads (See Note 2), from Bainbridge, Chickies, Rambo, Swedeland and Union Stone Co., Penn., to Cleveland, Lorain, Alliance and Canton, O., $2.20 per gross ton, and from Bainbridge, Swedeland and Union Stone Co., Penn., to Massillon, O., $2.20 per gross ton.

22718. To amend Agent Cottrell's Tariff, I.C.C. 469, and Items 1900A and 1968 of Agent Curlett's I. C. C. A260, in connection with rates on **sand** as follows: Wherever Albion, N. Y., appears, change to read Albion, N. J., and wherever Grenlock, N. Y., appears, change same to read Grenloch, N. J.

22928. **Gravel and sand,** other than blast, core, engine, fire, foundry, glass, molding or silica, carloads (See Note 2), from Machias, N. Y., to Attica, N. Y., 83c per net ton. Present rate, 91c per net ton. Reason—Proposed rate is comparable with rates on like commodities to Irvins Mills and Belfast, N. Y.

22929. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads, **and/or gravel,** carloads (See Note 2), **from** Carpenterville, N. J., to Aquashicola, Penn., $1.15 per net ton. Present rate, 17½c per 100 lb. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

22969. **Fluxing limestone,** carloads (See Note 2), from Hummelstown, Swatara, Palmyra, Annville and Myerstown, Penn., to Jersey City, Bayonne, Newark, Perth Amboy, Grasselli, Carteret, Chrome, Bayway, Maurer, Elizabethport, Elizabeth, Garwood, Lincoln, Plainfield, Bound Brook, Somerville, Raritan, Wharton and Flemington, N. J., $1.80 per gross ton. Reason—Proposed rates are comparable with rates from and to points in the same general territory.

22982. **Trap rock, mine rock, broken stone, crushed stone and stone screenings,** in bulk, carloads (See Note 2), from Jamesville and Rock Cut, N. Y., to Portland and Water Gap, Penn., $1.60 per net ton. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

22984. **Crushed stone,** carloads (See Note 2), from Northampton, Penn., to all stations on the Raritan River R. R., $1.75 per net ton. (Present rate, 21½c per 100 lb.) Reason—Proposed rate is same as that in effect on slag.

22990. **Ganister stone,** carloads (See Note 2), from Cumberland, Md., to Steelton, Penn., $2.50 per net ton, and Trenton, N. J., **$2.90 per net ton.** Reason—Proposed rates are comparable with rates from Madley, Penn.

22526. **Sand,** carloads (See Note 2), from Perth Amboy, N. J., district to Hull, Que., 26½c per 100 lb.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

18994. **Sand, common** (not moulding, fire, filter or blasting), run of the bank or screened; **gravel,** screened (See Note 3), from Albany, N. Y., to various N. Y. C. R. R. stations, representative points shown below:

To	Present	Proposed
Philmont, N. Y.	Class	$1.00 net ton
Millerton, N. Y.	Class	1.20 net ton
Patterson, N. Y.	Class	1.30 net ton
Brewster, N. Y.	Class	1.40 net ton

Reason—To establish commodity rates comparable with existing rates.

SOUTHERN FREIGHT ASSOCIATION DOCKET

49121. **Sand and gravel,** from Johnsonville and Perryville, Tenn., to **M. & O. R. R. and I. C. R. R.** stations in West Tennessee and Kentucky. It is proposed to establish through commodity rates on sand and gravel, carloads, from Johnsonville and Perryville, Tenn., to various points on the M. & O. R. R. and I. C. R. R. in West Tennessee and Kentucky, based on the 17517 scale for actual distances, same to apply in lieu of the present rates made on combination basis. Present and proposed rates, in cents per net ton, from and to representative points, are as follows, viz., from Perryville, Tenn.

To M. & O. R.R. stas., viz.:	Pres.	Prop.
Henderson, Tenn.	158	105
Kenton, Tenn.	158	115
Crockett, Tenn.	158	125
I. C. R.R. stas, viz.:		
Medon, Tenn.	108	105
Bolivar, Tenn.	118	105
Greenfield, Tenn.	118	115
McConnell, Tenn.	128	125

49156. **Sand and gravel,** from Richmond, Va., to Virginian Ry. stations. Lowest combination now applies. It is proposed to establish commodity rates on sand and gravel, carloads (See Note 3), from Richmond, Va., to Virginian Ry. stations. The proposed rates are the same as in effect from Petersburg, Va. Statement of proposed rates to the destinations involved will be furnished upon request.

49172. **Sand and gravel,** from Paducah, Ky., Johnsonville and Perryville, Tenn., to M. & O. R. R. Tennessee destinations. It is proposed to establish through commodity rates on sand and gravel, carloads, from the origins mentioned to M. & O. R. R. stations named below, same to apply in lieu of rates made on lowest combination. Present and proposed rates are as follows, rates in cents per 100 lb.:

From Paducah, Ky., to Tennessee points

	Pres.	Prop.		Pres.	Prop.
Selmer	199	135	Ramer	199	140
Falcon	199	135	Guy's	199	140

From Johnsonville, Tenn., to Tennessee points:

	Pres.	Prop.		Pres.	Prop.
Selmer	179	125	Ramer	179	125
Falcon	179	125	Guy's	179	125

From Perryville, Tenn., to Tennessee points:

	Pres.	Prop.		Pres.	Prop.
Selmer	*168	115	Ramer	*168	115
Falcon	*168	115	Guy's	*168	115

*Applies on gravel, carloads only. Rate on sand, carloads, 179c.

The suggested rates are based on the 17517 scale for the actual distance.

49203. **Phosphate rock,** from Pensacola, Fla., to Little Rock, Ark. It is proposed to establish rate of 24½c per 100 lb. on phosphate rock, as described in Item 3050 of S. W. L. Tariff 82-F, I. C. C. 2135, from Pensacola, Fla. (to apply only on import and coastwise traffic, and to apply from shipside), to Little Rock, Ark. Same as the rate suggested under Submittal No. 48243 from Gulfport, Miss., and Mobile, Ala.

49206. **Ground phosphate rock,** from Florida points to destinations in southern territory in A. C. L. R. R., I. C. C. B-2363 and S. A. L. Ry. I. C. C. A-7329, including Virginia cities but not including Ohio and Mississippi river crossings and Gulf ports nor points in Florida. It is proposed to establish through rates from Florida mines to destinations in southern territory, on ground phosphate rock, in bags, carloads, same as published in A. C. L. R. R., I. C. C. No. B-2363, and S. A. L. Ry. I. C. C. A-7329, on ground phosphate rock, in bulk, carloads.

49210. **Sand and gravel,** from Ellerslie, Petersburg and Warmore, Va., to Piedmont, W. Va. It is proposed to establish reduced rate of 365c per net ton on sand and gravel in straight or mixed carloads (See Note 3) from and to above named points.

49241. **Limestone** from Bon Aqua, Tenn., to N. C. & St. L. Ry. stations. It is proposed to establish rates on **limestone, ground, crushed or pulverized** to fineness sufficient to pass through screen of $\frac{1}{16}$-in. mesh, carloads, minimum weight 30,000 lb., from Bon Aqua, Tenn., of 108c per net ton to N. C. & St. L. Ry. stations, as follows: Life, Huron, Luray, Beech Bluff, Ranger, Harlan & Morris Spur, East Union, Jackson, Dresden, Ralston, Martin, Gardner, Terrell, Sheffnet, Gibbs and Union City, Tenn., in lieu of the present rate of 113c per net ton. The suggested rate is the same as at present applicable from Newsom, Tenn.

49246. **Phosphate rock,** from Mt. Pleasant-Centreville District to Cape Girardeau, Marquette and Illmo, Mo. Combination now applies for account of Missouri Pacific R. R. Proposed rate, for account of the Missouri Pacific R. R., **on phosphate rock, crude lump** or **crude ground,** in bulk or in bags, carload minimum weight as prescribed in L. & N. R. R., I. C. C. A-15803, from the district above named, as shown in L. & N. R. R., I. C. C. A-15803, to Cape Girardeau, Marquette and Illmo, Mo., 537c per net ton. Same as the rate to Cape Girardeau for account of the St. L.-S. F. Ry.

WESTERN TRUNK LINE DOCKET

3350A. Minimum weight. **Gravel, sand and stone,** carloads, between points in W. T. L. territory. Present—When minimum weights on above named articles are based on the capacity of car, also when minimum weight of 80,000 lb. or more is specifically provided, and cars are loaded to full visible capacity, actual weight will govern. Proposed—Amend committee and individual lines' issues, naming rates on commodities shown herein, when minimum weights in connection with such rates are based on the marked capacity of car, also when minimum weights are 80,000 lb. or more, to provide that when cars are loaded to full visible capacity, actual weight will govern.

2079-O. **Stone, crushed,** carloads (See Note 2), but not less than 40,000 lb., from Berlin, Utley, Wis., to South Rockwood, Mich. Present rates, class or combination; proposed, $2.40 per net ton.

3952B. **Stone, crushed, ground or broken,** carloads (See Note 2), but not less than 40,000 lb., from Quincy, Ill., to Sioux Falls, S. D. Present rate, 18c per 100 lb.; proposed, 13½c per 100 lb.

7076-A. **Sand, crude alumina,** minimum weight 80,000 lb., from Marysvale, Utah, to Chrome, N. J. Present rate, $20.40 per net ton; proposed, $15 per net ton.

Georgia Intrastate Rates on Sand and Gravel

THE Georgia commission, in Georgia Public Service Commission et al. vs. United States and Interstate Commerce Commission, has asked a three-judge court, in the northern district of Georgia, Atlanta division, to enjoin, annul and set aside the Commission's order in No. 17517, rates on chert, clay, sand and gravel within the state of Georgia, 122 I. C. C. 133, and 140 I. C. C. 85, requiring the railroads to establish rates within Georgia on the commodities specified in the title proceeding, in accordance with the scale prescribed for interstate application, not later than March 3. The order was issued because the Georgia commission, instead of establishing rates on the level of the interstate scale, made a revision in accordance with its own judgment, varying from the interstate scale, on the theory that that revision would remove unjust discrimination against interstate commerce and undue prejudice as between shippers and localities engaged in interstate commerce, on the one hand, and shippers and localities engaged in intrastate commerce, on the other.

When the case was reopened, after the Georgia revision, the federal body limited the further hearing to the question whether the rates and minimum weights required by the Georgia commission, in relation to the rates prescribed by the federal body, would cause any undue or unreasonable advantage, preference or prejudice, as between persons and localities, or any unjust discrimination against interstate or foreign commerce. Nothing was permitted to show or tend to show, what level of rates would remove unjust discrimination or any undue prejudice that might be found. The Georgia commission claimed that there should be an investigation of that sort. The federal commission took the position that the level of interstate rates would be proper within Georgia.

In its application for an injunction the Georgia commission asserts that the orders of the Commission are arbitrary and unreasonable and beyond the power of the federal body and that the reports and orders constitute an unlawful invasion of the sovereign rights of the state reserved to it by the Constitution of the United States and of the citizens of the state. It further alleges they constitute an unlawful exercise of power by the Commission, without warrant or authority under the Constitution or the interstate commerce act.—*Traffic World.*

Virginia Lime Rates

IN a proposed report on further hearing in No. 19943 (Sub. No. 1), North American Cement Corp. vs. Aberdeen and Rockfish et al., Examiner Howard Hosmer has recommended that the Interstate Commerce Commission affirm its former findings as to the rates on lime from Martinsburg and Berkeley, W. Va., to destinations in Virginia. In addition, Hosmer said, the Commission should find that to the extent the present Virginia intrastate rates differ from the Southen lime scales, approved in Lime Between Southern Points, 129 I. C. C. 635, they constituted unjust discrimination against

interstate commerce, which should be removed by prescribing the Southern lime scales for intrastate application. The former report in this case is in 153 I. C. C. 431.

The case involves not only rates on lime, but on limestone as well. In the former report the Commission found the rates on lime and ground limestone, from the West Virginia points of origin mentioned, unreasonable and unduly prejudicial. In this report Hosmer recommended a ground limestone scale beginning with rates of 60 cents per net ton for single-line hauls of 20 miles and less and 68 cents for joint-line hauls. The scale provides a single-line rate of 115 cents for 80 miles, single-line, and 118 cents for joint-line hauls.

At 90 miles the rate is 120 cents for both single and joint-line hauls. At 200 miles it becomes 150 cents; 175 cents for the block between 280 and 320 miles; 185 cents at 400 miles and runs out with a rate of 200 cents for 521 miles.

Examiner Hosmer said that that scale should be used in making rates from Martinsburg and Berkeley to remove the prejudice against those points and undue preference for competitors.

Crushed Stone Rates

LOSS of contracts, due to alleged unjust and unreasonable rates by respondent carriers on carload shipments of crushed stone from Dalmatia to various points in Pennsylvania, was presented at a recent Public Service Commission hearing at Harrisburg, Penn., as the grounds for complaint by the Susquehanna Stone Co. against these rates.

The respondent companies were the Pennsylvania Railroad, Reading, Delaware, Lackawanna and Western, Lehigh Valley, New York Central and Buffalo and Susquehanna Railroad. Most of the shipments are to Bloomsburg, Berwick, Mt. Carmel, Milton and Millersburg, it was testified by John B. Caldwell, of the complainant company.—*Hazelton* (Penn.) *Plain-Speaker.*

Iowa Cement Makers Seek Coal Rate Readjustment

HEARING on an application of Mason City cement manufacturing interests for a readjustment of intrastate coal freight rates, carlots, mines to Mason City, was adjourned by the Iowa Railroad Commission to permit presence of various parties to the controversy at a later date.

There is a prospect that the commission will submit the entire structure of intrastate coal rates for revision when the hearing is resumed. The date of the new hearing was not set.

B. A. MacDonald and B. J. Drummond offered testimony in behalf of the complainant, the Northwestern Portland Cement Co., Mason City. Virtually every railroad company in the state was represented. The complaint stated that intrastate coal rates now are discriminatory and prohibitive, especially those involving hauls over two carriers before the destination is reached.—*Sioux City* (Iowa) *Journal.*

Deny Reparation on Cement Shipped from Ada, Okla., to Texas

APPLICATION of the Commission's rule intended to prevent piece-meal litigation, Rule III (s) of the rules of practice, has been made by the Commission, division 3, in No. 20855, Oklahoma Portland Cement Co. vs. M-K-T of Texas, and those of eight sub-numbers thereunder found to come within the rule. In a report written by Commissioner Aitchison the Commission found an award of reparation on shipments of cement, from Ada, Okla., to points in Texas to be precluded by the rule mentioned. Therefore the complaints were dismissed.

A further finding is that rates, from Ada, Okla., to Artesia and Roswell, N. M., are not unreasonable or unduly prejudicial. The complaint concerning those rates, as well as those asking for reparation to destinations in Texas, were dismissed.

The complainant, Commissioner Aitchison said, sought an award of reparation on the basis of rates prescribed in No. 15151, Oklahoma Portland Cement Co. vs. Denver and Rio Grande Western, 128 I. C. C. 63, called the Texas case. The rates therein prescribed became effective December 12, 1927. The complainant relied on that case. The title complaint in the Texas case, he said, was brought by the complainant here but contained no prayer for reparation.

Dolomite Rates from Ohio to Eastern Points

EXAMINER R. N. Trezise, in No. 21593, National Mortar and Supply Co. vs. Pennsylvania et al., has recommended that the Commission find unreasonable the rates on raw dolomite stone, from Gibsonburg, O., to destinations in western New York, western Pennsylvania, West Virginia and the gas belt in Indiana to the extent they exceeded, exceed or may exceed the rates under the so-called Michigan scale prescribed by the federal Commission in National Mortar and Supply Co. vs. Ann Arbor, 152 I. C. C. 429, from Gibsonburg to points in Michigan, the scale being the same as in use in Michigan, including the differentials for joint-line hauls.

The points specifically mentioned as destinations are Olean and Dunkirk, N. Y., Erie, Pittsburgh, Connellsville, Blairsville and Washington, Penn., Morgantown, Fairmont, Grafton and Clarksburg, W. Va., and Gas City, Dunkirk, Muncie and Hartford City, Ind., and glass producing points taking the same rates.

Examiner Trezise said that the Commission should award reparation on shipments to Clarksburg, W. Va., and Muncie, Ind., made by the complainant.—*Traffic World.*

Variations in Rates Within City Barred

DIFFERENT rates cannot be required for various industries lying within the same municipality depending upon their respective distances from origin or destination, the railroad commission has stated in an order disposing of a complaint of the Wausau Sand and Gravel Co., Wausau, Wis., against several railroads.

To require such rates would introduce into the rate structure a complicated mass of individual rates, the commission said; a new element of great complexity which would open the door for endless complaints and litigation, and would in general serve no general or useful purpose; nor could such rates practically be made based upon the peculiar operating conditions governing the transportation of any particular traffic to or from each particular industry.

All industries within the switching limits constitute what is analogous to a rate group, the commission said. The average distance to all of them produces average results which are in the aggregate fair. What little may be gained by the carrier on traffic to or from an industry favorably situated in the municipality is compensated for by the burden imposed by industries less favorably situated, but the difference in general as between the various local industries is so slight as to be inconsiderable in making rates.—*United States Daily.*

Wherever Wheels and Shafts Turn

AN INTERESTING 149-page book of the above title, replete with illustrations featuring the uses and applications of roller bearings, has been published by the Timken Roller Bearing Co., Canton, Ohio. While it covers the general subject of the application of Timken bearings to all sorts of automotive, railway, and industrial equipment in some detail, there are sections relating specifically to applications which are of importance to rock products operators.

The book is conveniently divided into brief sections, each covering a particular type of equipment. In the first part (pages 1 to 100) the advantages and uses of Timken bearings in various types of industrial, railway, automotive, household and farm machinery are stressed. The second part (pages 101 to 149) contains technical information on bearing mountings and installations, which should be of important value to engineers.

Slate and Fluorspar Tariff Amendments Adopted

THE U. S. Senate has adopted an amendment proposed by Senator Dale, Vermont, increasing the duty on slate from 15 to 25% ad valorem. The amendment proposed by Senator Copeland, N. Y., reducing the duty on fluorspar containing above 93% of calcium fluoride from $8.40 to $5.60 a ton was also adopted.—*Wall Street News.*

Keystone Portland Erects New Storage Silos

KEYSTONE PORTLAND Cement Co., Bath, Penn., recently awarded a contract to the Rust Engineering Co., Pittsburgh, Penn., for the erection of a battery of 19 concrete silos for cement storage and two additional packhouses, each packhouse to have two three-spout Bates packing machines.

The new improvements will double the shipping facilities of the plant.

Universal-Atlas Makes New Appointments

NEW appointments in the Universal Atlas Cement Co., subsidiary of the United States Steel Corp., are announced by B. F. Affleck, president, following the joining of the Universal Portland Cement Co. and Atlas Portland Cement Co.

E. D. Barry, superintendent of the plant at Universal, Penn., is now assistant operating manager with offices in Chicago. Mr. Barry, a graduate of the Massachusetts Institute of Technology, has been connected with the Universal company for more than 25 years. Leonard Wesson, assistant general superintendent, Atlas division, has been appointed assistant operating manager with headquarters in Chicago. In his new position Mr. Wesson will return to familiar ground, as he was formerly a member of the Universal organization. He has had more than 20 years' experience in the cement industry.

J. C. Witt, chemical engineer, has been transferred from the Buffington, Ind., plant to Chicago. He is a graduate of Butler College, of the University of Chicago and of the University of Pittsburgh, taking his Ph. D. degree at the latter institution. For three years he was engaged in chemical research for the Portland Cement Association and is the author of many articles on the subject. Mr. Witt has been with the Universal company since 1924. T. A. Hicks, general chemist, Atlas division, is appointed to the same position with the new company, with offices in Chicago. For many years Mr. Hicks was associated with the Atlas company and has a high standing in the technical and engineering world.

R. L. Slocum, who hitherto was assistant superintendent at the Universal, Penn., plant, is now superintendent. He is a graduate of Pennsylvania State College and was connected with the Carnegie Steel Co. until he came to Universal. Last year he was awarded the Judge Gary medal for 25 years' continuous service.

H. H. Lauer, engineer, Atlas division, who has been made assistant chief engineer, Chicago, has been with the Atlas company several years. Previously he was connected with the Illinois Steel Co. and related industries and has had extensive experience in the engineering field.

Sewell Lime Co. Organized at Orofino, Idaho

A NEW company, Sewell Lime Co., has been incorporated at Orofina, Idaho, for $500,000, to develop limestone deposits owned in the vicinity. Its incorporators and stockholders, according to the records, are H. D. Britan, Minerva Britan, Walter Sewell, Esther Sewell, Ernest U. Falen, Edyth Falen, J. M. Molloy and Theodore Blake.

The property has been reported on by W. S. Keith, who said in part: "The deposit on Orofino creek is an especially large deposit of white crystalline limestone, exceptionally well situated beside a railroad spur, thus eliminating the expense of aerial or other tram transportation to shipping bunkers and kilns. From surface showing alone there is sufficient to guarantee materail for several years' continuous operations and when opened up may prove of startling proportions."

A 15-car track with double end connections is to be built soon, according to the report.—*Orofino* (Idaho) *Tribune.*

New Earle Cement Plant at Hope, England

THE new Hope, Derbyshire, cement mill of G. and T. Earle, Ltd., was put in production late in 1929. With an initial capacity of 3300 bbl. per day, obtained from two 270 ft. by 8 ft. 4 in. dia. rotary kilns equipped with "Unax" coolers, it has a number of unusual features, particularly in its crushing department. The primary breaker is a 72-in. by 48-in. jaw crusher, the largest ever built in England. Its capacity is about 250 tons per hour reducing stone to 7-in. size. Secondary crushing is by a Symons 7-ft. cone crusher which reduces the stone to 1-in. and under.

The cement mill is equipped with F. L. Smidth and Co. machinery, including "Unidan" grinding mills and "Fluxo" pneumatic conveyors, for transporting finished cement to storage silos. Wilfley pumps are used for the slurry. At the packing plant two portable "Fluxo" conveyors are in use; these are tapped in to the silo which is to be emptied. —*Cement, Lime and Gravel* (England).

Penn-Dixie to Reopen Kingsport, Tenn., Mill

OPERATIONS at the Kingsport, Tenn., cement mill of the Pennsylvania-Dixie Cement Corp. will be resumed about March 1, according to a recent report in the *Bristol* (Va.) *Herald.* The mill has been down for a number of months, during which time the equipment has been modernized. The opening date is said to be official.

Western Indiana Gravel to Operate Servicing Plant

A NEW equipment servicing plant has been opened by the Western Indiana Gravel Co., Lafayette, Ind., at Elwood, Ind. The plant, purchased from the Ames Shovel and Tool Co., has been converted into a well equipped machine shop, structural steel department and boiler shop, with modern machinery.

Although repair of gravel plant equipment will be the principal object of the plant's establishment, some manufacture of this type of machinery will be carried on. From 20 to 40 men will be employed.

The Western Indiana Gravel Co. owns and operates seven plants and gravel pits in other cities as follows: Metropolis, Ill.; Iona, Mich.; Warsaw, Anderson, Dundee, Lafayette and Terre Haute, Ind.—*Elwood* (Ind.) *Leader.*

New Silica Sand Company Formed at Michigan City

ACCORDING to recent advices, Michigan City Core Sand Corp. has been incorporated at Michigan City, Ind., with Carter H. Manny, H. H. Spaulding and G. R. Knickerbocker as the incorporators. Mr. Manny has been identified with the sand industry for many years, and was president of the Hoosier Slide Sand Co., which was largely instrumental in the removal of the famous Hoosier slide. The new company is scheduled to begin operations about March 15. The first unit to be opened will be on the property just east of Bartlett's Lake Shore addition, and served by the Chicago, South Shore and South Bend railroad. This property fronts along Lake Michigan, and is actually a continution of the old Hoosier slide dune. This sand will be shipped entirely by rail, but a simplified plan for making shipments by boat is being considered.

The company also expects to handle foundry supplies along with the shipping of Michigan City sand, establishing selling offices in the larger foundry centers. A Chicago office has already been established in Room 1928 McCormick building. The Michigan City office of the company is in the Warden building.

Fluorspar Shipments Increase

NOTEWORTHY FEATURES in the fluorspar industry in 1928 were the substantially increased domestic shipments—the largest since 1922; the decreased imports (chiefly from Germany and the United Kingdom)—the smallest since 1923; the resumption of fluorspar mining in Nevada; the greatly increased domestic production of acid-grade fluorspar—the largest since 1920 and more than four times that in 1927; and the increase, effective November 16, 1928, in the rate of duty on fluorspar, containing not more than 93% of calcium fluoride, from $5 a short ton to $7.50 a short ton, according to a statement prepared by Hubert W. Davis of the United States Bureau of Mines, Department of Commerce.

Shipments

The flourspar shipped from mines in the United States in 1928 amounted to approximately 140,631 short tons and was valued at approximately $2,658,549, as compared with 112,546 tons, valued at $2,034,728, in 1927. Thus there were increases of 25% in quantity and of 31% in total value as compared with 1927. Fluorspar was shipped from Colorado, Illinois, Kentucky, Nevada and New Mexico in 1928, but Colorado and New Mexico recorded decreases.

The reported shipments of fluorspar for use in the manufacture of steel, glass enamel and vitrolite and hydrofluoric acid were more than in 1927, but the shipments to foundries were less, and the quantity exported was about the same as in 1927.

The general average value, i.e., selling prices per ton f.o.b. shipping points for all grades of fluorspar in 1928 was $18.90, which is 82 cents more than the average for 1927. The increase in the general average value for 1928 is due to the larger production and higher selling price of acid-grade fluorspar. The general average value of the flourspar shipped to steel plants in 1928 from the Illinois-Kentucky district was $15.27 a ton and from the Colorado-New Mexico district $12.19 a ton. These values compare with $16.59 for the Illinois-Kentucky district and $13.72 for the Colorado-New Mexico district in 1927. This difference in average values represents chiefly economic factors in marketing rather than differences in quality of fluorspar from these two districts.

Stocks at Mines

According to the reports of producers, the stocks of fluorspar at mines or at shipping points on December 31, 1928, amounted to 10,433 short tons of gravel fluorspar, 999 tons of lump fluorspar and 714 tons of ground fluorspar, a total of 12,146 tons of "ready-to-ship" fluorspar. In addition there was in stockpiles at mines at the close of 1928 about 60,500 short tons of crude (run-of-mine) fluorspar, which must be milled before it can be marketed and which is calculated to be equivalent to about 35,000 tons of merchantable fluorspar. These stocks compare with 23,402 tons of "ready-to-ship" fluorspar and 49,231 tons of crude fluorspar on December 31, 1927. Thus the stocks of merchantable flourspar decreased about 48%, but the stocks of crude fluorspar increased about 23% as compared with 1927.

Imports

The total imports of flourspar into the United States in 1928, amounting to 47,183 short tons, represent a decrease of 34% from 1927, and are the smallest since 1923. The imports in 1928 are equivalent to 34% of the total shipments of domestic fluorspar, as compared with 64% in 1927.

The United Kingdom, which from 1922 to 1926 has been the chief source of the imported fluorspar, supplied only 20% of the total in 1928, the imports of 9360 tons therefrom representing a decrease of 49%. As in 1927, Germany was the chief source of imports in 1928, supplying 37% of the total. The imports from Germany in 1928, however, were 45% less than in 1927. France was the second largest source of imported fluorspar in 1928, supplying 32%.

The figures on consumption of fluorspar in 1927 and 1928 and stocks at consumers' plants at the close of each of these years, given in the following table, while not including data from all consumers, are believed to fall not far short of the total for the United States. Thus, the figures for the basic open-hearth steel industry, the chief consumer of fluorspar, include actual figures for the 70 companies that make 99.4% of the total basic open-hearth steel and estimates for the other two companies. Consumption of all electric-steel and ferro-alloy manufacturers that are known to use fluorspar is accounted for. The smaller foundries, some of which use a little fluorspar, are not all represented, so that the figures for this industry are somewhat incomplete. The figures for fluorspar used in the manufacture of hydrofluoric acid represent actual figures for five companies and an estimate for one company. The consumption and stocks for the glass and enamel industries, although not covering all consumers, represent 112 companies.

FLUORSPAR IMPORTED*
(GENERAL IMPORTS)

Country	1927	1928
Argentina	....	20
Belgium	21	....
Canada	560	....
China	449	756
France	11,711	15,072
Germany	31,829	17,601
Italy	449	1,033
Spain	978	680
Union of South Africa	7,069	2,661
United Kingdom	18,449	9,360
	71,515	47,183

*Figures compiled from records of the Bureau of Foreign and Domestic Commerce and those for 1928 subject to revision.

FLUORSPAR CONSUMED AND IN STOCK IN THE UNITED STATES, 1927-1928

Industry	1927 Consumption	1927 Stocks at consumers' plants December 31	1928 Consumption	1928 Stocks at consumers' plants December 31
Basic open-hearth steel	138,000	85,000	152,000	76,000
Electric-furnace steel	4,700	1,200	6,100	1,300
Foundry	3,400	1,000	3,300	1,000
Ferro-alloys	500	100	800	400
Hydrofluoric acid and derivatives	15,500	13,000	20,500	11,000
Enamel and vitrolite	5,800	800	5,700	900
Glass	6,800	900	6,200	1,200
Miscellaneous	1,500	400	1,600	600
	176,200	102,400	196,200	92,400

FLUORSPAR SHIPPED FROM MINES IN THE UNITED STATES, 1927-1928, BY STATES

State	1927 Short tons	1927 Value Total	1927 Value Average	1928 Short tons	1928 Value Total	1928 Value Average
Illinois	46,006	$ 863,909	$18.78	65,884	$1,154,983	$17.53
Kentucky	57,495	1,040,338	18.09	69,747	1,426,766	20.46
Colorado	6,432 }	130,481	14.43	} 5,000*	76,800*	15.36*
New Mexico	2,613 }					
Nevada	....	....	....			
	112,546	2,034,728	18.08	140,631*	2,658,549*	18.90*

*Approximate and subject to slight revision.

FLUORSPAR SHIPPED FROM MINES IN THE UNITED STATES, 1927-1928, BY KINDS

Kind	1927 Short tons	1927 Value Total	1927 Value Average	1928 Short tons	1928 Value Total	1928 Value Average
Gravel	97,036	$1,599,310	$16.48	122,202	$2,129,329	$17.42
Lump	4,960	105,062	21.18	6,146	160,803	26.16
Ground	10,550	330,356	31.31	12,283	368,417	29.99
	112,546	2,034,728	18.08	140,631	2,658,549	18.90

FLUORSPAR SHIPPED FROM MINES IN THE UNITED STATES, 1927-1928, BY USES

Uses	1927 Short tons	1927 Value Total	1927 Value Average	1928 Short tons	1928 Value Total	1928 Value Average
Steel	93,196	$1,523,915	$16.35	108,205	$1,643,185	$15.19
Foundry	4,533	84,724	18.69	3,694	66,215	17.93
Glass	5,968	184,450	30.91	6,499	195,885	30.14
Enamel and vitrolite	3,813	119,888	31.44	4,713	142,495	30.23
Hydrofluoric and derivatives	3,748	98,364	26.24	15,946	585,092	36.69
Miscellaneous	903	15,880	17.59	1,176	19,091	16.23
Exported	385	7,507	19.50	398	6,586	16.55
	112,546	2,034,728	18.08	140,631	2,658,549	18.90

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Cement Products Receive Attention by American Concrete Institute

ONE SESSION of the American Concrete Institute's recent convention at New Orleans, La., was devoted to cement and concrete products.

W. D. M. Allan (manager, Cement Products Bureau, Portland Cement Association), briefly summarizing "A Study of Volume Changes in Concrete Masonry Walls," said that shrinkage was important enough to study and to take preventative measures. The study was confined to concrete block walls. The use of green block should be especially avoided. Shrinkage of sand and gravel aggregate blocks was least; cinder block the most.

Recommended Practices

P. M. Woodworth (Portland Cement Association), reporting for the committee on concrete products on "Recommended Practice for the Manufacture of Standard Concrete Masonry Units," said in part:

"Since the former committee presented proposed 'Recommended Practice for the Manufacture of Concrete Building Block, Building Tile and Brick' adopted as tentative in 1925, the production of concrete block has more than doubled. One of the principal factors in this marked growth has been the increasing use of concrete masonry for above grade construction. With this development a number of physical properties of the concrete unit, in addition to strength, absorption and permanence, are of increasing importance. These factors are fire resistance, sound insulation, heat insulation at low temperatures, shrinkage of wall sections, nailability surface texture and weight per square foot of wall area. New methods of molding, proportioning, mixing and curing have been proposed and used to develop in one way or another certain of these important properties or to effect manufacturing economies. The use of lightweight aggregates of a porous nature, either natural or manufactured, to furnish these desirable properties also has necessitated the development of a new technique in certain of the manufacturing methods.

"The committee believes that a recommended practice for the manufacture of concrete brick should be developed separate from that covering concrete block and tile. This recommendation is made for the following reasons:

"1. Concrete brick specifications are only tentative and considerable difficulty is being experienced in making further progress.

"2. Relative interest in concrete brick is decreasing.

"3. Research work would be greatly increased if brick were included, thus retarding progress in concrete block and tile.

"4. Desirable properties in concrete brick are frequently different from those of block and tile.

"Various divisions of the 1925 report are herewith discussed in view of changes in plant practice and more recently developed information."

Further Research Needed

Concluding, the author said that further research into manufacturing details is necessary so that the processes, whereby desirable qualities of a concrete unit are enhanced, will be standardized. The principal factors to be studied are as follows:

"1. Manufacturing technique for different types of aggregate.

"2. The effect of different curing methods upon early strength, shrinkage and cost.

"3. The effect of grading on sound insulation and acoustics.

"4. Evaluation of all desirable properties of concrete masonry to produce a unit that gives the most satisfactory results for the different uses to which it is to be put.

"5. Factors affecting weather resistance and the development of an accelerated weather resistance test."

Block-Plant Operation

Benjamin Wilk (Standard Building Products Co., Detroit, Mich.), reporting on "Plant Design for Single or Multiple Shift Operation," summarized the committee findings as follows:

"It is difficult to generalize the design of a plant, because so much depends upon local conditions and in each case a careful analysis of layout and equipment must be made to secure lowest unit cost and dependable manufacturing conditions.

"From this analysis we find in the multiple shift plant:

"1. Slightly lower investment.

"2. Higher production cost at night due to
- (*a*) Bonus for night work.
- (*b*) More breakage on night shifts.
- (*c*) More accidents on night shifts.
- (*d*) Need for additional supervision.

"In the single shift plant we find:

"1. Greater flexibility in handling machines.

"2. More uniform production.

"3. Better quality of product.

"4. Opportunity to meet unexpected demands and less machinery trouble.

"5. Better supervision.

"6. Lower unit cost of production.

"On the basis of this comparison it is evident that in the concrete products industry the single shift plant is to be preferred over the multiple shift plant."

High Pressure Steam Curing

P. M. Woodworth reported the results of "Some Tests of Concrete Masonry Units Cured with High Pressure Steam" made at the plant of the Crume Brick Co., Dayton, Ohio. The process of curing concrete products in sand-lime-brick, steam-pressure cylinders was developed by W. H. Crume in 1928 and first reported to the Sand-Lime Brick Association in 1929 (ROCK PRODUCTS, February 16, 1929). The conclusions from these tests are as follows:

"1. Units cured in high pressure steam developed strength at two days greatly in excess of the strength obtained at 28 days by moist curing, air curing or low pressure steam curing.

"2. Although there was an apparent retrogression in strength of the high pressure steam-cured units between the ages of 2 and 9 days, there was a slight increase in strength between the ages of 9 and 28 days in all cases.

"3. The interval between molding and curing in high pressure steam did not have an appreciable effect upon the compressive strength of tile steamed 4, 8 and 24 hr. after

molding, but units steamed ½ hr. after molding had about 90% of that obtained for longer intervals.

"4. High pressure steam curing greatly reduced shrinkage of concrete masonry panels laid up with wet units and when air-dry units were used the shrinkage was practically nil.

Curing with High Pressure Steam

"It is believed that high pressure steam curing has possibilities as a means for developing concrete products having high early strength and low shrinkage when laid up in masonry walls. The results of these tests should not be construed as conclusive. Additional information concerning the effect of high pressure steam curing on strength of units shrinkage of masonry walls using different aggregates, methods of molding, consistencies, gradings, durations and variations of pressure should be obtained before definite conclusions concerning the value of this method of curing concrete products can be drawn."

Color in Products

Raymond Wilson (Portland Cement Association) reported as chairman of the committee on this subject, which covered a review of the present methods available: (1) Colored pigments; (2) surface treatment or penetration; (3) colored aggregates. The general conclusion seemed to be that the colored aggregate method was the most satisfactory, when viewed from all angles.

Cast Stone

Louis A. Falco (the Decorative Stone Co., New Haven, Conn.) reported in part as follows: "Cast stone should be composed of portland cement and hard, durable aggregates of such colors and in such proportions as to produce, when finished, the desired appearance, strength and density. All materials used in the manufacture of cast stone should pass the standard tests for such materials as adopted by the American Society for Testing Materials.

"Cast stone should be manufactured in an inclosed building and after being removed from molds should be stacked for curing under moist conditions for at least seven days. It should then be allowed to dry out, being protected from air currents and the sun's rays. Generally, cast stone should be aged at least 14 days before being delivered to the job.

"Cast stone should be the product of a manufacturer having the capacity and facilities for furnishing the quality, sizes and quantities of cast stone required without delaying the progress of the work and whose products have been previously used and exposed to the weather with satisfactory results.

"Cast stone should have a compressive strength of at least 5000 lb. per sq. in. and an absorption of not more than 7% nor less than 3% when tested in accordance with the American Concrete Institute tentative specification for cast stone (P-3-A-29T).

"Cast stone should be definitely specified according to the following classification:

"Cut cast stone—Planer rubbed finish, bush hammered finish, machine tooled finish, crandalled finish, hand tooled finish, sawed finish.

"Surfaced cast stone—Hand rubbed finish, brushed finish, acid washed finish.

"Plain cast stone."

Track gang laying concrete ties on a section of the Mexican National Rys.

Concrete Railroad Ties Used in Mexico

DURING the past two years the Inter Oceanic Railway, operated by the National Railways of Mexico, has been doing considerable experimental work with concrete ties. The results obtained have been quite satisfactory, so there is a possibility that the concrete tie will replace the wooden tie altogether eventually. The Compania de Cemento Portland "Landa," S. A., Puebla, Mex., is much interested in the outcome of these experiments, for extended use of concrete ties offers a desirable outlet for its cement.

Alton J. Blank, chief chemist for the Landa company, designed the concrete mixes,

Section of track with ties tamped over

performed the necessary tests in connection with fabrication and other details. About 9 kilometers (about 5½ miles) of concrete ties have been installed on the Inter Oceanic Railway between Puebla and Mexico City, and the experiment as well as all other work is in charge of Senor I. Romo, Jefe de la Division de Puebla, The National Railways of Mexico.

For the information above and the illustrations accompanying, ROCK PRODUCTS is indebted to Mr. Blank.

Testing concrete ties for load strength

A broken tie, showing its reinforcement

Cement Prices Slightly Higher

FEARS that the prospective 1930 building boom, stimulated by President Hoover's business survey conference, might advance cement prices sharply are not supported by current price statistics gathered by the U. S. Department of Labor.

The average mill price for bulk lots of cement for the first 10 days of February, as reported to the department, was $1.67 a bbl., which compared with an average of $1.60 for the entire year 1929, $1.67 for 1928 and $1.68 for 1927.

Base mill prices advanced fractionally on January 17 and again on January 31, and the average for February to date was 18 cents a bbl. above the October, 1929, average, which was the lowest monthly average in several years.

The upward tendency since December is attributed by officials of the Bureau of Mines to the seasonal upswing of the consumption curve, which regularly dips to the lowest point of the year in the months of November, December and January.

About February 1, as outdoor work is resumed, the cement consumption curve turns upward again, rising sharply until August. The midsummer peak production in recent years has been in the neighborhood of 22,000,000 bbl. a month. The January low is at the rate of only about 5,000,000 bbl. a month.

The department's statistics show somewhat uniform seasonal price movements since 1913, which correspond roughly to the consumption curve.—*Cleveland* (Ohio) *Press.*

Graphite in 1928

STATISTICS and brief textual matter on graphite are published in the Bureau of Mines bulletin, "Graphite in 1928." During 1928 the graphite industry progressed. The quantity of natural graphite sold or used by producers in 1928 amounted to 5611 short tons and was valued at $297,093, an increase of 8% in quantity and of 28% in value compared with 1927. The increase in quantity was chiefly in amorphous graphite; the quantity of crystalline was only slightly larger than in 1927. The total quantity includes 2994 tons of amorphous and 2617 tons of crystalline graphite, an increase of 15% in amorphous but of only 0.2% in crystalline. The value of the amorphous variety in 1928 was $43,320, an increase of 21% over 1927, and that of the crystalline was $253,773, an increase of 29%. The quantity and value of the crystalline graphite in 1928 were the largest since 1920.

The states contributing to the total in 1928 were Alabama, Georgia, Michigan, Nevada, New Jersey, Rhode Island and Texas.

Four states reported crystalline graphite in 1928—Texas, Alabama, New Jersey and Georgia, named in order of importance. In Alabama there were three producers reporting—the Alabama Machinery and Supply Co., Montgomery, with mine at Mountain Creek; the Superior Flake Graphite Co., Chicago, Ill., with mine at Ashland, and the Southwestern Consolidated Graphite Co., Boston, Mass., with mine at Hollins. The Alabama-Quenelda Graphite Co., Birmingham, with mine near Lineville, Ala., failed to reach the productive stage in 1928. In California, the Standard Graphite Corp., Los Angeles, was idle during 1928, as were the other graphite-producing companies in the state. In Georgia, Joe Porterfield, Royston, reported the sale of a small quantity of crystalline graphite during the year. In Montana the Crystal Graphite Co., Dillon, reported only a small production for experimental purposes; the National Carbon Co., Inc., New York City, acquired a graphite property in Beaverhead county, but at the end of 1928 had not developed it. In Texas the only operator was the Southwestern Consolidated Graphite Co., Boston, Mass., with mine at Burnet.

Three states reported amorphous graphite in 1928—Rhode Island, Michigan and Nevada, named in order of importance. In Michigan the only operator was the Detroit Graphite Co., Detroit, with mine at L'Anse; in Nevada the only operator was the Carson Black Lead Co., Oakland, Calif., with mine at Carson, and in Rhode Island the only operator was the Graphite Mines Co., Providence, with mine at Cranston.

Crystalline graphite was reported as having been sold in 1928 for batteries, crucibles, electrotyping, foundry facings, lubricants, paints and stove polish. Amorphous graphite was reported as having been sold or used principally for paint manufacture.

In 1928 the average value of domestic crystalline graphite at the mine ranged from 1.5 to 5.8 cents per lb., compared with 2.5 to 7 cents per lb. in 1927. The general average value of domestic crystalline graphite was 4.8 cents in 1928, compared with 3.8 cents in 1927.

Recent Contract Prices

Fayette, Iowa. E. F. Patton, operator of local quarry, has set delivered prices on agricultural limestone from 80 cents per ton for the first mile to $2.15 per ton for 15-mile haul.

Center Point, Iowa. Agricultural limestone offered at $1.40 per ton at the crusher.

Retail Prices of Various Rock Products Materials

THE TABLE below gives average prices paid January 1, 1930, by contractors for various rock products, delivered on the job at different principal cities of the United States. These prices were secured through the Bureau of Census.

AVERAGE RETAIL PRICES FOR ROCK PRODUCTS MATERIALS, JANUARY 1, 1930

City	MATERIAL: Portland cement, per bbl. excl. of cont.	Gypsum wallboard, 3/8-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, 3/4-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.80	....	$20.00	$1.50	$2.25	....
New London, Conn.	3.00	$25.00	26.00	1.50	2.40	$18.00
New Bedford, Mass.	2.40	25.00	18.50	1.75	3.00	18.50
Haverhill, Mass.	2.80	27.50	20.00	1.75	......	18.75
Poughkeepsie, N. Y.	2.04	....	....	2.25	2.20	....
Albany, N. Y.	2.97	24.75	18.00	......	......	17.00
Rochester, N. Y.	2.70	22.00	21.00	2.50	2.40	16.00
Syracuse, N. Y.	3.00	22.50	26.00	2.00	2.00	17.00
Buffalo, N. Y.	3.10	25.00	18.00	2.50	2.05	14.00
Paterson, N. J.	2.60	26.00	18.00	1.50	2.10	17.50
Trenton, N. J.	2.40	26.00	18.00	1.50	2.10	17.50
Scranton, Penn.	2.80	....	18.00	3.25	......	17.00
Philadelphia, Penn.	2.35	....	15.50	1.75	2.40	19.75
Baltimore, Md.	2.75	....	13.00	2.00	2.75	16.00
Washington, D. C.	2.60	25.00	14.00	......	......	19.00
Richmond, Va.	3.10	31.00	17.50	1.95	2.45	20.00
Fairmount, W. Va.	2.90	35.00	17.00	3.25	3.50	18.00
Winston-Salem, N. C.	2.54	23.50	....	2.50	3.50	17.00
Atlanta, Ga.	2.85	....	15.00	3.04	3.00	16.50
Savannah, Ga.	2.25	25.00	20.00	2.00	......	16.00
Louisville, Ky.	2.40	....	15.50	2.20	2.43	17.00
Tampa, Fla.	2.40	....	24.00	2.00	4.25	22.50
Birmingham, Ala.	3.00	....	20.00	3.00	......	17.00
Shreveport, La.	3.40	....	22.50	2.00	3.80	....
Erie, Penn.	$2.60	$25.00	$17.00	$2.25	......	$16.00
Columbus, Ohio	2.75	23.00	17.50	2.25	$2.50	15.00
Toledo, Ohio	......	22.50	20.00	3.04	2.50	16.00
Cincinnati, Ohio	2.92	25.00	16.40	2.53	2.55	....
Cleveland, Ohio	2.56	....	16.00	2.57	2.65	12.50
Youngstown, Ohio	2.95	....	20.00	3.71	2.75	....
Detroit, Mich.	2.60	21.00	14.80	2.75	3.00	....
Saginaw, Mich.	2.80	25.00	20.00	2.50	3.00	18.00
Terre Haute, Ind.	2.75	28.00	18.00	1.65	3.50	17.00
Chicago, Ill.	1.80	....	16.00	1.63	1.90	14.75
Milwaukee, Wis.	2.60	25.00	....	2.00	2.00	18.00
Lansing, Mich.	2.76	....	22.00	2.25	2.25	16.00
Des Moines, Iowa	2.66	23.75	20.00	1.60	3.60	....
St. Louis, Mo.	2.20	....	18.00	2.70	1.90	17.00
Kansas City, Mo.	2.40	25.00	23.00	2.00	1.87	15.00
St. Paul, Minn.	2.60	25.00	21.00	1.40	2.00	16.00
Sioux City, Iowa	2.80	27.00	26.00	1.50	2.25	16.00
Grand Forks, N. D.	2.80	25.00	....	2.60	......	16.00
San Antonio, Tex.	2.82	37.00	20.00	2.10	2.35	20.90
Tucson, Ariz	2.91	....	30.00	1.25	2.25	15.00
Los Angeles, Calif.	2.20	34.00	24.00	1.70	2.05	17.50
Long Beach, Calif.	2.46	34.00	26.00	2.16	2.30	17.50
San Francisco, Calif.	2.60	....	22.50	1.40	1.60	20.00
Seattle, Wash.	2.65	35.00	22.00	1.40	......	20.00

The Rock Products Market

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.48	.48	1.15	1.25	1.40	
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.25	1.15	1.75		1.75	1.75
Buffalo, N. Y.	1.00	1.05	1.05	1.05	1.05	
Erie, Penn.	.75	.95				
Milton, N. H.			1.75		1.25	1.00
Montoursville, Penn.	1.00	.70	.60	.50	.50	.40
South Portland, Me.		1.00	2.25			
Georgetown, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Appleton, Minn.		.50	1.25		1.50	
Attica, Ind.	All sizes .75–.85					
Barton, Wis.		.40d	.50d	.60d	.60d	.60d
Beloit, Wis. (f)	.60	.30	.30	.40	.40	.40
Des Moines, Iowa	.40– .60	.60– .80	1.50–1.70	1.50–1.70	1.50–1.70	1.50–1.70
Dresden, Ohio		.60– .70		.70– .80	.70– .80	
Eau Claire, Wis.		.55	.70	1.00	1.00	
Elkhart Lake and Glenbeulah, Wis.	.40	.40	.60	.60	.60	.60
Grand Rapids, Mich.	.50	.50	.70	.80	.80	.70
Hamilton, Ohio	.90-1.20	.90–1.20	.90–1.20	.90..1.20	.90–1.20	.90–1.20
Hersey, Mich.		.50		.50	.70	.70
Humboldt, Iowa	.40	.40	1.25	1.25	1.25	1.25
Indianapolis, Ind.	.50– .75	.40– .60	.50– .75	.50– .75	.60– .85	.60– .85
Kalamazoo, Mich.	1.00	.50	.50	.60	.65	.75
Kansas City, Mo.	.70	.70				
Mankato, Minn.	.55	.45		1.25	1.25	
Mason City, Iowa	.50	.50	.80	1.25	1.25	1.25
Milwaukee, Wis.	.91	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.35	.35	1.25	1.25	1.25	1.25
St. Paul, Minn. (e)	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.00	1.00
SOUTHERN:						
Charleston, W. Va.	.70	1.25	1.25			
Eustis, Fla.		.40– .50				
Fort Worth, Texas	.75	.75	.90	1.00	1.00	1.10
Knoxville, Tenn.	.85	1.00	1.20	1.20	1.20	1.20
Roseland, La.		.30	1.25	.80	.80	.80
WESTERN:						
Los Angeles, Calif.	.10– .40	.10– .40	.20– .90	.50– .90	.50– .90	.50– .90
Oregon City, Ore.	All grades range from 1.00 to 1.50 per cu. yd.					
Phoenix, Ariz. (c)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.70	.60			1.20	1.15
Seattle, Wash.	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*

*Cu. yd. ‡Delivered on job by truck. (c) 60-70% crusher boulders. (d) Plus 15c for winter loading. (e) Prices f.o.b. N. P. Ry. (f) Algonquin, Ill., district, 5c per ton higher.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; per ton f.o.b. plant.

City or shipping point	Molding, fine	Molding, coarse	Molding brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.75	2.75	2.85			4.00	
Cheshire, Mass.	Sand for soap, 7.00–8.00					6.00–8.00	
Dresden, Ohio	1.50–1.75	1.25–1.50	1.50		1.50		
Eau Claire, Wis.						2.50–3.00	
Elco, Ill.	Soft amorphous silica, 92%–99% thru 325 mesh, 18.00–40.00 per ton						
Franklin, Penn.	1.75	1.75					
Kasota, Minn.							1.50
Montoursville, Penn.				1.35–1.60			
New Lexington, Ohio	2.25	2.00					
Ohlton, Ohio	1.75*	2.00*		2.00*	1.75*	1.75*	
Ottawa, Ill.	1.25–3.25	2.25–3.50	1.25–3.25	1.25–3.25	1.25	3.50	3.50
Red Wing, Minn. (a)					1.50	3.00	1.50
San Francisco, Calif.	3.50†	5.00†	3.50†	2.50–3.50†	5.00†	3.50–5.00†	
Silica, Mendota, Va.	Potters' flint, 8.00–14.00						

†Fresh water washed, steam dried. *Damp. (a) Filter sand, 3.00.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.50
Eau Claire, Wis.	4.30	1.00
Franklin, Penn.		1.75
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	1.25–3.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.		1.75

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. plant.

Cheshire, Mass., in carload lots	5.00–7.00
Franklin, Penn.	2.25
Klondike, Mo.	2.00
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
San Francisco, Calif.	4.00–5.00
Silica and Mendota, Va.	2.50–3.00

Bank Run Sand and Gravel

Prices given are per ton, f.o.b. producing plant or nearest shipping point.

Appleton, Minn.†	.55
Beloit, Wis.¶ (½-in. and less)	.30
Brewster, Fla. (sand, ¼-in. and less)	.40– .50
Burnside, Conn. (sand, ¼-in. and less)	.75*
Chicago, Ill.†	.92–1.20
Des Moines, Ia. (sand and gravel mix)	.60–1.05
Fort Worth, Tex.¶ (2-in. and less)	.70
Gainesville, Tex.¶ (1-in. and less)	.55
Gary and Miller, Ind.†	1.15–1.40a
Grand Rapids, Mich.¶ (2-in. and less)	.50
Hamilton, Ohio¶ (1½-in. and less)	.50–1.00
Hersey, Mich.¶ (1-in. and less)	.50
Mankato, Minn.†	.70
Pueblo, Colo.—†River run sand	.50
Seattle, Wash.—Sand, 1/10-in. down, .25*; ¼-in. and less, same; gravel in sizes ranging from 2-in. and less to ½-in. and less	.25*
Winona, Minn.†	.60
York, Penn. Sand, ¼-in. and less, 1.00; 1/10-in. down	1.10

*Cubic yard. †Fine sand, 1/-10-in. down. (a) Cu. yd., delivered Chicago. ¶Gravel.

Current Price Quotations

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.91¼	3.05	4.30¶
Atlanta, Ga.		1.99	*3.49¶
Baltimore, Md.		2.26	3.40¶
Berkeley, Calif.		2.14	
Birmingham, Ala.		1.65	*3.15¶
Boston, Mass.	.57	1.78–1.88	3.27¶
Buffalo, N. Y.	.61¼	1.95–2.05	3.35¶
Butte, Mont.	.90¼	3.61	
Cedar Rapids, Ia.		2.03–2.16	2.99f
Centerville, Calif.		2.14	
Charleston, S. C.		2.09a	*3.26¶
Cheyenne, Wyo.	.71½	2.26	
Chicago, Ill.		1.75	3.15¶
Cincinnati, Ohio		1.92–1.94	3.22¶
Cleveland, Ohio		1.84–1.94	3.24¶
Columbus, Ohio		1.92	3.22¶
Dallas, Texas		1.65	3.14¶
Davenport, Iowa		1.94–2.04	
Dayton, Ohio		1.84–1.94	3.24¶
Denver, Colo.	.63¾	2.55	
Des Moines, Iowa	.48½	1.94	2.99f
Detroit, Mich.		1.75	3.25¶
Duluth, Minn.		1.84	
Fresno, Calif.		2.33	
Houston, Texas		1.75	3.38¶
Indianapolis, Ind.	.54¾	1.79	f3.19–3.19¶
Jackson, Miss.		2.09–2.29	*3.59¶
Jacksonville, Fla.		2.14b	*3.26¶
Jersey City, N. J.		2.13	3.28¶
Kansas City, Mo.	.48	1.82–1.92	f3.22–3.07¶
Los Angeles, Calif.	.36½	1.46	
Louisville, Ky.	.55½	1.91	f2.92–3.31¶
Memphis, Tenn.		2.09–2.29	f3.55–*3.55¶
Merced, Calif.		2.01	
Milwaukee, Wis.		1.90	3.30¶
Minneapolis, Minn.		2.07	
Montreal, Que.		1.60	
New Orleans, La.	.43	1.82	3.22¶
New York, N. Y.	.60¾	1.93–2.03	3.33¶
Norfolk, Va.		1.87–1.97	3.27¶
Oklahoma City, Okla.	.54	2.36	3.51¶
Omaha, Neb.	.50¼	2.22	3.37¶
Peoria, Ill.		1.92	3.32¶
Pittsburgh, Penn.		1.75	3.01¶
Philadelphia, Penn.		2.15	3.30¶
Phoenix, Ariz.		3.51	
Portland, Ore.		2.40	
Reno, Nev.		2.86	
Richmond, Va.		2.16–2.32	3.56¶
Sacramento, Calif.		2.25	
Salt Lake City, Utah	.70¼	2.81	
San Antonio, Texas			3.42¶
San Francisco, Calif.		2.14	
Santa Cruz, Calif.		2.10	
Savannah, Ga.		2.09a	*3.16¶
St. Louis, Mo.	.48¾	1.75	f3.00–3.00¶
St. Paul, Minn.		2.07	
Seattle, Wash.		2.15	f3.70
Tampa, Fla.		1.80	*3.41¶
Toledo, Ohio		2.00–2.03	3.33¶
Topeka, Kan.	.50¼	2.11	3.26¶
Tulsa, Okla.	.50¾	2.23	3.38¶
Wheeling, W. Va.		1.92–2.02	3.07¶
Winston-Salem, N. C.		2.14	3.54¶

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.	High Early Strength
Albany, N. Y.		2.15	
Bellingham, Wash.		2.25	
Buffington, Ind.		1.70	
Chattanooga, Tenn.		2.05	
Concrete, Wash.		2.65	
Davenport, Calif.		2.05	
Hannibal, Mo.		1.90	
Hudson, N. Y.		1.75	
Leeds, Ala.		1.65	
Lime & Oswego, Ore.		2.40	
Mildred, Kan.		2.35	
Nazareth, Penn.		2.15	
Northampton, Penn.		1.75	
Richard City, Tenn.		2.05	
Steelton, Minn.		1.85	
Toledo, Ohio		2.20	
Universal, Penn.		1.70	

NOTE: With exception of prices for "Incor" and "Velo" cement, prices quoted are net prices, without charge for bags, and all discounts deducted. Add 40c per bbl. for bags. (a) 44c refund for paid freight bill. (b) 38c bbl. refund for paid freight bill. (f) "Velo" cement, including cost of paper bag, 10c disc. 10 days. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c disc. 15 days. *Subject 25c bbl. dealer discount.

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chazy, N. Y.	.75	1.60	1.60	1.30	1.30	1.30
Ft. Spring, W. Va.	.35	1.35	1.35	1.25	1.15	1.15
Jamesville, N. Y.	.60	1.00	1.00	1.00	1.00	....
Oriskany Falls, N. Y.	1.00	1.25	1.25	1.25	1.25	1.25
Prospect Junction, N. Y.	.50– .80	1.15u	1.15	1.10	1.10	1.10
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
Shaw's Junction, Penn. (e)	.85	1.20–1.35	1.20–1.35	1.20–1.35	1.40	1.30–1.35
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill. (b)	1.85	....	1.85	....	....	....
Cypress, Ill.	1.15	1.10	1.00	1.15	1.15	1.20
Davenport, Iowa	1.00	1.50	1.50	1.30	1.30	1.30
Dubuque, Iowa	1.00	1.00	1.20	1.10	1.10	....
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05–1.70	1.05–1.70	....
Greencastle, Ind.	1.25	1.00	1.00	1.00	1.00	1.00
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
McCook, Ill.	.90	1.00	1.00	1.00	1.00	1.00
Montreal, Canada	.75–1.00	1.65–1.85	1.45	1.15	1.05	.95
Sheboygan, Wis.	1.00	1.00	1.00	1.00	....	....
Stone City, Iowa	.75	....	1.10	1.00	1.00	1.00h
Toledo, Ohio	1.60	1.79	....	1.60	....	1.60
Toronto, Canada (i)	2.70	2.70	2.50	2.50	2.50	2.50
Waukesha, Wis.	....	.90	....	.90	.90	....
Wisconsin points	.50	....	.100	.90	.90	....
Youngstown, Ohio	1.00	1.00	1.25	1.25	1.25	1.25
SOUTHERN:						
Chico and Bridgeport, Texas	1.00–1.35	1.10–1.30	1.10–1.25	1.25	1.00–1.20	1.00
Cutler, Fla.	.50– .75r	....	....	1.75r	....	1.10g
El Paso, Texas	.50	1.25	1.25	1.00	1.00	1.00
Olive Hill, Ky.	1.00	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (t)	.25	.25	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.10	1.25	1.25	1.25	1.00	....
Richmond, Calif.	.75	....	1.00	1.00	1.00	....
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45
Stringtown, Okla.	1.00–1.35	1.10–1.30	1.10–1.25	1.25	1.00–1.20	1.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	....
Duluth, Minn.	.90–1.00	2.25	1.75	1.75	1.25	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Texas	2.50	2.00	1.45	1.25	1.20	1.15
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	....
Northern New Jersey	1.55	2.30	2.10	1.70	1.70	....
Richmond, Calif.	.70	....	1.00	1.00	1.00	....
Toronto, Canada (i)	4.70	5.80	....	4.05	....	....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Cayce, S. C.—Granite	.50	....	1.75	1.75	1.60	....
Chicago, Ill.—Granite	2.00	1.70	....	1.50	1.50	....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	....	....	2.25–2.50s	....	....	....
Lithonia, Ga.—Granite	.50	1.60	1.35	1.25	1.15	....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	....
Middlebrook, Mo.—Granite	3.00–3.50	....	2.00–2.25	2.00–2.25	....	1.25–3.00
Richmond, Calif.—Quartzite	.75	....	1.00	1.00	1.00	....
Toccoa, Ga.—Granite	.50	1.35	1.35	1.25	1.25	1.20

(a) Limestone, ¼ to ⅛ in., 1.35 per ton; Lime flour, 8.50 per ton. (b) Wagonloads. (c) 1 in., 1.40. (d) 2-in., 1.30. (e) Price net after 10c discount deducted. (g) Per cu. yd., 3-in. and less. (h) Rip rap. (i) Plus 25c per ton for winter delivery. (n) Ballast, R.R., .90; run of crusher, 1.00. (q) Crusher run, 1.40; ¼-in. granlithic finish, 3.00. (r) Cu. yd. (s) 1-in. and less, per cu. yd. (t) Rip rap, 1.20–1.40 per ton. (u) ⅝-in. and less.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Allentown, Penn.	1.00–1.50	.40– .60	.80–1.00	.50– .80	.50– .80	.60– .80	.80
Bethlehem, Penn.	1.25–1.75	.50– .70	1.00–1.25	.60– .80	.70– .80	.70– .90	.90
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Hokendauqua, Penn.	1.25–1.75	.60	.90	.60– .90	.60– .90	.60– .90	....
Reading, Penn.	2.00	1.00	....	1.00	....	....	....
Swedeland, Penn.	1.50–2.50	.60–1.10	1.00–1.25	.90–1.25	.90–1.25	1.25	1.25
Western Pennsylvania	2.00	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	....	1.30*	1.80*	1.55*	1.55*	1.45*	....
Jackson, Ohio	....	1.05*	1.80*	1.45*	1.30*	1.30*	....
Toledo, Ohio	1.50	1.10	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.	....	1.05*	1.80*	1.45*	1.45*	1.45*	....
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.90
Longdale, Va.	2.50	.75	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*	....	1.15*	.90*	.90*	....

5c per ton discount on terms. †1¼ in. to ¼ in., 1.05; ⅝ in. to 10 mesh, 1.25*; ⅝ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$; 0% $MgCO_3$; 100% thru 4 mesh	1.85
Belfast, Me.—Analysis, $CaCO_3$, 90.4%; $MgCO_3$, trace; 90% thru 100 mesh, per ton	10.00
Branchton, Penn.—94.89% $CaCO_3$; 1.50% $MgCO_3$, 100% thru 20 mesh; 80% thru 80 mesh and 60% thru 100 mesh	3.50–5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Cartersville, Ga.—90% thru 100 mesh, 2.00; 50% thru 50 mesh	1.50
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, per ton	6.00
Gibsonburg, Ohio—Bulk, 2.25; in bags	3.70
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, bags, 3.75; bulk	2.50
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Marlbrook, Va.—(Lime marl)—Analysis, $CaCO_3$, 90%; 90% thru 100 mesh, in bags, 3.50–4.00; bulk	2.00–2.25
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.50

Agricultural Limestone

(Crushed)

Atlas, Ky.—Analysis, $CaCO_3$, 94-98%; $MgCO_3$, trace; 90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98½% $CaCO_3$; ½% $MgCO_3$; 90% thru 10 mesh; 30% thru 100 mesh	1.50
Chico and Bridgeport, Texas—Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh	1.00
Charles-Town, W. Va.—Lime Marl—Analysis, 95% $CaCO_3$, 50% thru 100 mesh, bulk, 3.00; including burlap bags	4.50
Colton, Calif.—100% thru 14 mesh, bulk	3.50
Cypress, Ill.—Analysis, 96% $CaCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.25; 90% thru 50 mesh, 1.20; 50% thru 50 mesh, 90% thru 4 mesh and 50% thru 4 mesh, all	1.10
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 4 mesh, 50% thru 20 mesh; bulk, per ton	1.10
Dubuque, Ia.—Analysis, 34.96% $CaCO_3$; 59.62% $MgCO_3$; 90% thru 4 mesh	.95
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Fort Spring, W. Va.—Analysis, 90% $CaCO_3$; 3% $MgCO_3$; 50% thru 100 mesh	1.15
Gibsonburg, Ohio—90% thru 10 mesh	1.00–1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh, sacked	5.00
Jamesville, N. Y.—Analysis, 89% $CaCO_3$; 5% $MgCO_3$; 90% thru 100 mesh; in paper bags, 5.10; bulk	3.85
Lannon, Wis. — Analysis, 54% $CaCO_3$ 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook and Gary, Ill.—Analysis, 60% $CaCO_3$, 40% $MgCO_3$; 90% thru 4 mesh	.90
Rocky Point, Va.—50% thru 200 mesh, bulk, in carloads, 2.00; 100-lb. paper bags, 3.25; 200-lb. burlap bags	3.50
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh	1.15–1.70
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
West Stockbridge, Mass.* — Analysis, 95% $CaCO_3$; 90% thru 100 mesh, bulk	3.50
100-lb. paper bags, 4.75; 100-lb., cloth	5.25
Waukesha, Wis.—90% thru 100 mesh, 4.00; 50% thru 100 mesh	2.10

*Less 25c cash 15 days.

Pulverized Limestone for Coal Operators

Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton	6.00
Hillsville, Penn., sacks, 5.10; bulk	3.50
Joliet, Ill.—Analysis, 50% $CaCO_3$; 42% $MgCO_3$; 95% thru 100 mesh (bags extra)	3.50
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk	2.25–3.50
Waukesha, Wis. — 90% thru 100 mesh, bulk	4.00

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

(Carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime In bulk	Lump lime Per bbl.
EASTERN:								
Berkeley, R. I.	....	....	11.40	....	....	17.50	....	....
Buffalo, N. Y.	....	....	....	12.00	....	....	....	....
Knickerbocker, Devault, Cedar Hollow and Rambo, Penn.*	....	9.50	9.50	9.50	....	9.50	8.50	....
Lime Ridge, Penn.	....	....	9.00	....	6.50	8.00	5.00	....
CENTRAL:								
Afton, Mich.	....	....	....	....	....	10.75	7.50	....
Carey, Ohio	9.50		[illegible]	....	[illegible]		[illegible]	[illegible]
Cold Springs, Ohio	....	7.75	7.75	....	....	....	....	....
Gibsonburg, Ohio	10.50	....	....	....	7.00	9.00	....	....
Huntington, Ind.	....	6.50	6.50	....	....	....	....	....
Little Rock, Ark.	....	14.40	....	14.40	....	....	11.90	1.79
Marblehead, Ohio	....	6.50	6.50	....	....	....	7.00	1.50[3]
Milltown, Ind.	....	7.50– 8.50	....	8.25– 9.25	7.00[5]	9.25[6]	6.50[7]	1.40[8]
Scioto, Ohio	....	7.00	7.00	8.00	....	.62½	6.50	1.50
Sheboygan, Wis.	....	10.50	10.50	10.50	....	....	9.50	2.00[4]
Tiffin, Ohio	....	....	....	....	8.00	10.00	....	....
Wisconsin points	....	11.50	....	....	....	....	9.50	....
Woodville, Ohio	10.50	7.75	7.75	11.50[24]	7.00	9.00[9]	7.00	1.50[3]
SOUTHERN:								
Keystone, Ala.	17.00	9.00	9.00	8.00–12.00	....	....	6.00[21]	1.35
Knoxville, Tenn.	17.00	9.00	9.00	9.00	6.00	1.25[10]	6.00	1.35
Ocala, Fla.	12.00	10.00	10.00	12.00	....	....	....	1.40
Pine Hill, Ky.	17.00	9.00	9.00	9.00	6.00	1.25[10]	6.00	1.35
WESTERN:								
Kirtland, N. M.	....	....	....	....	....	....	12.00	....
Los Angeles, Calif.	....		....				2.00	
San Francisco, Calif.	19.00	14.00–17.00	12.50	14.00–19.00	14.50[20]	.90[17]	11.00[19]	1.85[17]
San Francisco, Calif.†	20.00	16.00	12.00	20.00	16.00	....	16.00	1.95

[1]Also 6.00. [2]To 1.35. [3]Wooden, steel, 1.60. [4]Steel. [5]To 7.50. [6]To 9.75. [7]To 7.00. [8]To 1.50 in steel drums; 1.25 and 1.35 in waterproof bags. [9]In 80-lb. paper. [10]Per bbl. [17]Less credit for return of empties. [19]To 14.50. [20]Also 13.00. [21]To 8.00. [24]Superfine, 92.25% thru 200 mesh. *Price to dealers. †Wood-burnt lime.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Penn Argyl, Penn.—Screened, all thru 200 mesh, 7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton. Granville, N. Y.—Red, green and black, $7.50 per ton. Pen Argyl, Penn.—Blue-black, 6.00 per ton in bulk, plus 10c per bag.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Buckingham oxford grey	13.88	17.22	24.99	29.44	34.44	45.55
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25
Gen. Bangor No. 2 ribbon	6.75– 7.25	....	....	....	....	....
Gen. Bangor mediums	9.50–11.25	....	....	....	....	....
No. 1 Albion clear	9.00–10.50	16.00	23.00	27.00	37.00	46.00
Chapman Quarries, Penn.—No. 1	9.25–11.25	....	....	....	....	....
Medium	7.75– 9.00	16.00	23.00	26.00	32.00	40.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00	....	....	....	....
Pen Argyl, Penn.*						
Graduated slate (blue)	....	16.00	23.00	27.00	37.00	46.00
Graduated slate (grey)	....	18.00	25.00	29.00	39.00	48.00
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00					
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50					
Albion-Bangor medium	8.00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50					
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.
*Unfading grey, 14.00–15.00; 10% disc. to roofer; 10%–8⅓% to wholesaler.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:
- Crude talc, per ton 5.00
- Ground talc (20-50 mesh), bags 6.50
- Ground talc (150-200 mesh), bags 9.00
- Pencils and steel crayons, gross 1.50– 2.00

Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¾% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh 7.50– 8.00
1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of bags. Terms 1%, 10 days.

Clifton, Va.:
- Crude talc, per ton 4.00
- Ground talc (150-200 mesh), in bags 12.00

Conowingo, Md.:
- Crude talc, bulk 4.00
- Ground talc (150-200 mesh), in bags 14.00
- Cubes, blanks, per lb. .... .10

Emeryville, N. Y.:
- Ground Talc (200 mesh), bags 13.75
- Ground talc (325 mesh), bags 14.75

Hailesboro, N. Y.:
- Ground talc (300-350 mesh) in 200-lb. bags 15.50–20.00

Henry, Va.:
- Crude (mine run) 3.50– 4.50
- Ground talc (150-200 mesh), bags 6.25–14.00

Joliet, Ill.:
- Ground talc (200 mesh) in bags:
- California white 30.00
- Southern white 20.00
- Illinois talc 19.00

Los Angeles, Calif.:
- Ground talc (150-200 mesh) in bags 16.00–25.00

Natural Bridge, N. Y.:
- Ground talc (325 mesh), bags 10.00–15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

- Gordonsburg, Tenn.—B.P.L. 65-72% 3.75– 4.25
- Mt. Pleasant, Tenn.—B.P.L. 75% 6.25
- Run of plant fines, 72% B.P.L., per ton of 2000 lb. 5.00

Ground Rock

(2000 lb.)

- Gordonsburg, Tenn.—B.P.L. 65–70% 3.75– 4.25
- Mt. Pleasant, Tenn. — Lime phosphate: B.P.L. 73% 11.80
- Mt. Pleasant, Tenn.—B.P.L., 72% 5.00– 5.50

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Mulberry, Fla.—Gross ton, f.o.b. mines
- 68/66% B.P.L. 3.15
- 70% minimum B.P.L. 3.75
- 72% minimum B.P.L. 4.25
- 75/74% B.P.L. 5.25
- 77/76% B.P.L. 6.25

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton 100.00–125.00
- Punch mica, per lb. .... .06
- Scrap, per ton, carloads 20.00

Rumney Depot, Bristol and Cardigan, N. H.—Per ton:
- Mine scrap 22.50
- Mine run (plate) 280.00
- Clean shop scrap 27.50
- Roofing mica 42.00
- Punch mica 160.00
- Trimmed mica, per ton, 20 mesh, 42.00; 40 mesh, 45.00; 100 mesh, 60.00; 200 mesh 75.00

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agri-cultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Blue Rapids, Kan.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Centerville, Iowa	....	....	6.00	7.00	....	7.50	8.50	10.50a	....	....	....	....	....
East St. Louis, Ill.—Special Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton, floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 3 in. long, 17c per ft., 23.00 per ton.													
Fort Dodge, Iowa	2.50	6.00	6.00	7.00	9.00	9.00	11.50	8.00	16.00	20.00	15.00	....	25.00
Grand Rapids, Mich.	....	....	....	....	9.00d	9.00d	....	8.00d	....	21.00d	....	15.00	25.00
Los Angeles, Calif. (b)	....	7.00–9.00	7.00–9.00	7.50–9.00	8.00–10.00	....	8.00–10.00	....	30.00c	....	....	....	....
Medicine Lodge, Kan.	1.40	....	....	....	....	....	11.50d	....	16.00d	11.50d	....	....	....
Portland, Colo.	....	7.00	7.00	9.00	9.00	9.50	9.00	....	27.50	....	22.50	27.50	....
Providence, R. I. (x)	....	....	....	12.00–13.00e	....	....	....	....	....	....	....	....	....
Seattle, Wash. (z)	6.00	9.00	9.00	13.00	....	....	14.00	....	....	....	....	....	....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	....	....	....	....	20.00	25.00g	33.00f

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) White molding. (b) Plasterboard, ¼x32x36-in., 14c-17c per sq. ft.; ⅜x32x36-in., 15c-18c per sq. ft. (c) To 40.00. (d) Includes paper bags. (e) Includes jute sacks. (f) "Gyproc," ⅜x48-in. by 5 and 10 ft. long. (g) ⅜x48-by 3 to 4 ft. long. (x) "Fabricaste" gypsum blocks, 2- and 3-in., f.o.b. motor trucks at plant, 7¼c-8¼c. Block setting plaster, per ton, in jute sacks, 12.00. (y) Jute sacks, 18.00; paper sacks, 16.00. (z) Gypsum partition tile, 3-in., 9c per sq. ft., 4-in., 11c per sq. ft.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N. Y.—Bio-Spar, per ton in bags in carload lots, 9.00; less than carload lots, 12.00 per ton in bags, bulk, per ton	....	7.50
Crown Point, N. Y.—Mica Spar	....	¶9.00–‖12.00
Davenport, Iowa — White limestone, in bags, per ton	‖6.00	‖6.00
Harrisonburg, Va.	11.00–14.50	....
Middlebrook, Mo.—Red	....	20.00–25.00
Middlebury, Vt.—Middlebury white	....	¶9.00–‖10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	....	c5.50
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits	....	12.00–40.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	....
Warren, N. H.	....	8.00–15.00

¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb. (c) Per ton f.o.b. quarry in carloads; 7.00 per ton L.C.L.

Soda Feldspar

De Kalb Jct., N. Y.—Color, white; pulverized (bags extra, burlap 2.00 per ton, paper 1.20 per ton); 99% thru 140 mesh, 16.00; 99% thru 200 mesh, per ton 18.00

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140 mesh (bulk) 19.00

Keystone, S. D.—Color, white; analysis, K_2O, 13.25%; Na_2O, 1.92%; SiO_2, 63.50%; Fe_2O_3, .06%; Al_2O_3, 20.10%, pulverized 99% thru 200 mesh, in bags, 17.50; bulk 16.50
Crude, in bags, 9.50; bulk 8.50

Coatesville, Penn.—Color, white; analysis, K_2O, 12.30%; Na_2O, 2.86%; SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; crude, per ton 8.00

Erwin, Tenn.—White; analysis, K_2O, 10%; Na_2O, 2.75%; SiO_2, 68.25%; Fe_2O_3, .10%; Al_2O_3, 18.25%, pulverized 98% thru 200 mesh, in bags, 17.20; bulk 16.00
Crude, in bags, 8.50; bulk 7.50

Rumney and Cardigan, N. H. — Color, white; analysis, K_2O, 9-12%! Na_2O, trace; SiO_2, 64-67%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Rumney Depot, N. H.—Color, white; analysis, K_2O, 8-13%; Na_2O, 1-1½%; SiO_2, 62-68%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; pulverized, bulk 18.00
(Bags, 15c extra.)

Cement Drain Tile

Graettinger, Iowa. — Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in. 1.35; 36-in. 2.00

Grand Rapids, Mich.—Drain tile, per 1000 ft.

4-in.	36.00
5-in.	48.00
6-in.	66.00
8-in.	100.00
10-in.	150.00
12-in.	210.00

Longview, Wash.—Drain tile, per 100 ft.

3-in.	5.00
4-in.	6.00
6-in.	10.00

Tacoma, Wash.—Drain tile, per 100 ft.

3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00

Chicken Grits

Centerville, Iowa	9.25
Belfast, Me.—(Agstone), per ton, in carloads	10.00
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per ton	8.50–10.00
Coatesville, Penn.—(Feldspar), per ton, in bags of 100 lb. each	8.00
Cranberry Creek, N. Y.—Per ton, in carload lots; in bags, 9.00; bulk, 7.50. Less than carload lots, in bags	12.00
Davenport, Iowa — High calcium carbonate limestone, in bags L.C.L., per ton	6.00
El Paso, Texas—(Limestone) per 100-lb. sack	.75
Los Angeles, Calif.—Per ton, including sacks: Gypsum	7.50 –9.50
Middlebury, Vt.—Per ton (a)	10.00
Randville, Mich.—(Marble), bulk	6.00
Seattle, Wash.—(Gypsum), bulk, ton	10.00
Warren, N. H.	8.50– 9.50
Waukesha, Wis.—(Limestone), per ton	7.00
West Stockbridge, Mass.	¶7.50–‖9.00
Wisconsin Points—(Limestone), per ton	15.00

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Barton Wis.	10.50
Dayton, Ohio	12.50–13.50
Detroit, Mich. (d)	e13.00–16.00*b
Farmington, Conn.	16.00
Grand Rapids, Mich.*	14.00–15.00
Jackson, Mich.	13.00
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00*
New Brighton, Minn.	8.00
Pontiac, Mich.	13.50
Portage, Wis.	15.00
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50
Sebewaing, Mich.	12.50
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	10.50–13.00b
Winnipeg, Canada	15.00

Delivered on job. (a) Less 50c disc. per M 10th of month. (b) 5% disc., 10 days. (c) Delivered in city. (d) Also 15.50. (e) Also 14.00. (f) Also 11.00, f.o.b. cars at plant. (g) F.o.b. yard.

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	Size 8x8x16
Camden, N. J.	16.50
Columbus, Ohio	14.00b–16.00†
Forest Park, Ill.	21.00*
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12a
Los Angeles, Calif.:	
4x8x12	4.50*
4x6x12	3.90*
4x4x12	2.90*

*Price per 100 at plant.
†Rock or panel face.
(a) Face. (b) Plain.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Cicero, Ill.—French and Spanish tile (red, orange, choc., yellow, tan, slate, gray) per sq., 9.50-10.00; green or blue, per sq.	11.50–12.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00

Cement Building Tile

Camden and Trenton, N. J.:	
3x8x16, per 100, 9.00; 3x9x16, per 100	9.00
4x8x16, per 100, 12.00; 4x9x16, per 100	13.00
6x8x16, per 100, 16.50; 6x9x16, per 100	15.50
Chicago District (Haydite):	
4x 8x16, per 100	13.00
8x 8x16, per 100	20.00
8x12x16, per 100	28.00
Columbus, Ohio:	
5x8x12, per 100	6.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00
Longview, Wash.:	
4x6x12, per 1000	55.00
4x8x12, per 1000	64.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Camden & Trenton, N. J.	17.00	....
Chicago District "Haydite"	14.00	....
Columbus, Ohio	16.00	17.00
Ensley, Ala. ("Slagtex")	13.00a	....
Forest Park, Ill.	....	37.00
Longview, Wash.	16.50	20.00– 40.00
Milwaukee, Wis.	14.00	32.00
Omaha, Neb.	17.00	30.00– 40.00
Philadelphia, Penn.	15.50	....
Portland, Ore.	12.00	22.50– 55.00
Prairie du Chien, Wis.	14.00	23.00
Rapid City, S. D.	18.00	30.00– 40.00

(a) Delivered on job; 10.00 f.o.b. plant.

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00

Note—Bags extra and returnable for full credit.

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	29.00	42.50	53.00
Brownsville, Tex.	....	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	....	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	35.00	50.00	65.00
Patchogue, N. Y.	....	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% disc.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

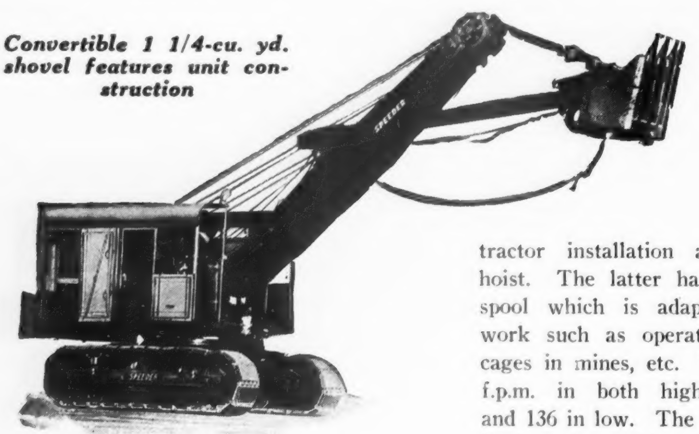
Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in
Grand Rapids Mich. (b)	......	......	......	.57	.67	.93	1.20	......	......	1.80	2.10	2.25	3.35	4.00	5.60	6.90	7.85
Houston, Texas	......	.19	.28	.43	.55½	.90	1.30	......	1.70†	2.20	......	......	......	......	......	......	......
Indianapolis, Ind. (a)	......	......	......	.75	.85	.90	1.15	......	......	1.60	......	2.50	......	......	......	......	......
Norfolk, Neb. (b)	......	......	......	.90	1.00	1.13	1.42	......	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Tiskilwa, Ill. (rein.)	......	......	......	.75	.85	.95	1.20	1.60	......	2.00	......	2.75	3.40	......	6.50	......	10.00
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	......	......	......	......	......	......	......	......	......	......
Wahoo, Neb. (b)	......	......	......	......	.85½	......	1.14	......	......	1.81	......	2.47	3.42	4.13	5.63	6.49	7.31

(a) 24-in. lengths. (b) Culvert; 21-in., 1.43. †21-in. diameter.

New Machinery and Equipment

Convertible $1\frac{1}{4}$-Cu. Yd. Shovel

MODEL 90, a new $1\frac{1}{4}$-cu. yd. power shovel, full revolving and convertible, powered by gasoline, electric or Diesel engine, is announced by the Speeder Machinery Corp., Cedar Rapids, Iowa. The new shovel has two working speeds on all operations, both driven direct from the power unit. High speed is for shovel work and medium for the crane or dragline adaption. Crawler mountings, 14 ft. 6 in. overall length, are used. Ground clearance is 17-in., the overall height from the ground to the top of cab being 11 ft.



Convertible 1 1/4-cu. yd. shovel features unit construction

Some of the features of the new shovel are the unit construction which allows removal of drum and vertical shafts with bearings complete for repairs or adjustments; use of Timken bearings throughout; automatic swing and travel brake which engages as soon as the clutches are released. The fast and automatic trip for the bucket is another feature claimed for the new model.

New Hoist Can Be Mounted as a Unit on Tractor

A NEW hoist, built for mounting on a McCormick-Deering tractor, is announced by the Trackson Co., Milwaukee, Wis. This, the manufacturer states, makes a flexible unit which can be quickly driven from one place to another under its own power. This equipment is said to be economical and convenient for operating dragline and clamshell buckets, hoisting materials from pits, mines and quarries, spotting and unloading freight cars, pulling loaded trucks up steep inclines and through mudholes and soft ground, hauling and skidding heavy machinery and materials, etc.

Some of the new features claimed for the Trackson hoist are improved screw type clutches, oversized drum shafts and increased cable capacity, hand lever control and ready adaptability from the single to a double drump type hoist. The auxiliary drum may be attached as the user needs it, without any alteration to the main drum unit. It is mounted directly over the main drum, making a complete, compact two-drum machine.

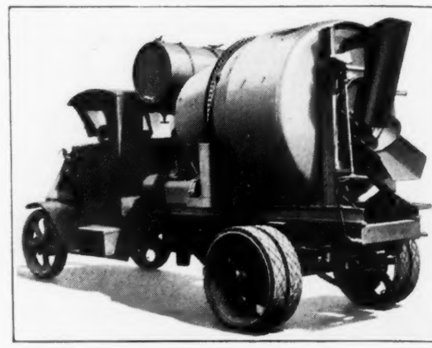
The new hoist is built both in the portable model for tractor installation and as a stationary hoist. The latter has a material elevated spool which is adapted to endless cable work such as operating material elevator cages in mines, etc. The line speed is 290 f.p.m. in both high and reverse gears and 136 in low. The elevator spool is readily interchangeable with the gypsy spool and can be installed quickly. The stationary hoist has a dog type clutch, transferring the power from the main drum shaft to the elevator spool. The latter can be operated independently of the main drum. The brake is of extra-large capacity.

New hoist mounted on tractor can be used for variety of purposes

Truck-Mounted Mixer Has Anti-Friction Suspension

CHAIN BELT CO., Milwaukee, Wis., has developed the Rex "Mix Haul," a self-contained unit for mixing of concrete en route to the job. The unit, made in 2-, 3- and 4-cu. yd. sizes, is designed for mounting on truck chassis of proper size, and requires no special truck transmission or power take-off.

The mixer is mounted low on the supporting frame, with large charging opening and variable flow discharge chute. The turning drum has a three-point anti-friction suspension, two Timken-mounted rollers in the rear, and the third, an S.K.F. self-aligning bearing, at the center. It is driven by "Chabelco" chains, the transmission being fully enclosed and running in oil. A water tank with cut-off sight gage carries water for each batch.



Self-contained ready-mixed concrete unit mounted on a truck

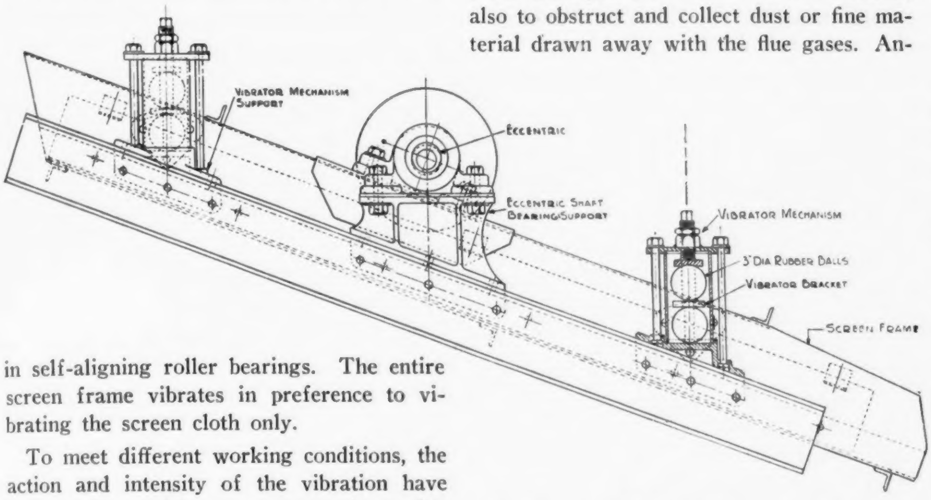
Cylindrical First Aid Kit

BULLARD Davis, Inc., San Francisco, Calif., are now manufacturing a cylindrical aluminum first aid kit, under license of the Standard Oil Co. of California. Within the Bullard cylindrical kit the first aid material is kept in unit packages rolled in a durable duck roll-up. The roll-up is easily removed from the kit and can be carried conveniently to the injured man. The design of the kit features visibility of the contents and simplicity of removal of desired units. The roll-ups are easily and conveniently carried from place to place. This is said to simplify and speed up the job of maintaining the kits in complete working order, as the roll-ups can be replenished at a central point.

First aid packages in a cylindrical case

New Vibrating Screen

GOOD Roads Machinery Co., Kennett Square, Penn., has recently developed a new vibrating screen for use in the aggregate industries and working on wet and dry materials, large or small size. Basically, the new screen is of the eccentric type, the vibrating action being imparted to the screen cloth by a high-speed eccentric shaft mounted in self-aligning roller bearings. The entire screen frame vibrates in preference to vibrating the screen cloth only.



Resilient rubber balls at the ends of the vibrating screen provide a cushioning effect

To meet different working conditions, the action and intensity of the vibration have been made variable; a range of possible changes in eccentricity from zero to ½-in. has been provided. No sprays are used in the screen construction, the self-cleaning "thump" features being imparted by the use of resilient rubber balls at the ends of the screen on four stabilizing arms. In this manner the screen is allowed to assume its own position on a cushion of four rubber balls, and is rebounded back to its original position against four more rubber balls which are over the stabilizing arms. The arrangement of the balls and housings is shown in the accompanying illustration.

The screen surface is arched to secure more even distribution of material over the cloth. Stock sizes of screen cloth, 36x72 in., are used. Power and maintenance requirements are said to be quite small. The new screen is supplied in single- or double-decked types.

Improved Vertical Dryer

A NUMBER of improvements have been made on the "F. E." vertical coal dryer, states the Technical Press Agency, London, Eng., in a recent announcement. The dryer is now adaptable for materials which are difficult to treat or of small size, the announcement continues. To facilitate the passage through the dryer of certain materials which are liable to bind, cling or "bridge," also to reduce the resistance of fine materials, to the suction of the flue gases, by increasing its porosity, the containing walls of the treating chamber are now constructed to allow of slight movement in a vertical direction, the distance of which can be varied to suit the material, as well as its rapidity. The motion is effected from the shaft of the outlet valve in a very simple manner, and it can be disconnected if and when not required. Owing to the very slight distance of movement, the power required is almost negligible. Another improved feature is the distribution and collecting screens, which are fitted in the intake chamber and in the exit chamber for flue gases. The object of these screens is to make the treatment more uniform throughout the mass of the material, also to obstruct and collect dust or fine material drawn away with the flue gases. Another device which has been introduced is to provide vents in the event of the material offering excessive resistance to the flow of the flue gases through it.

Vibrating Dewatering Conveyor for Final Rinsing of Aggregates

A VIBRATOR dewatering conveyor for final rinsing and washing of sized stone or gravel is announced by the Traylor Vibrator Co., Denver, Colo. This machine operates on the same principle as the Traylor company's vibrating screen, the motor units being placed above or below the conveyor to best meet conditions in the plant where the dewatering conveyors are installed. Each is equipped with perforated plate surface, the estimated capacity of a unit 30-in. wide being given at as high as 70 tons per hour. Discharge of water and slime can be taken out directly underneath the perforated plate or underneath the clean material discharge or, if operated up-grade, at the feed end of the conveyor.

New Crane Combines Features of Derrick and Locomotive Types

A NEW full circle, long boom, broad gage, crane and dragline is being offered by the American Hoist and Derrick Co., St. Paul, Minn., for use in general construction, excavating, sand and gravel industries. This machine will be known as the American "Revolver." Its main features are a combination of the advantages of both derricks and locomotive cranes—the ability to handle heavy working and lifted loads at wide working radius; ease of movement by wheel mounting on track, or skid and rollers over rough ground; simplicity of its all steel construction; stability and ready adaptation to all classes of heavy crane, derrick or dragline work.

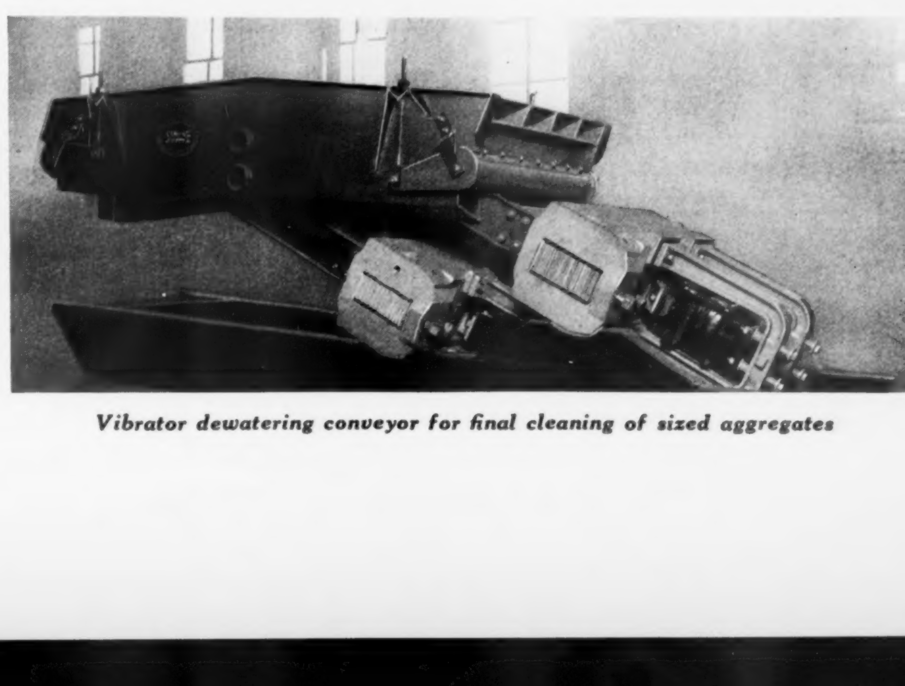
Either steam, electric, Diesel or gasoline power can be furnished. Mountings can be arranged to suit requirements; it can be mounted on eight double flanged wheels, wood skids, barge, pier or gantry type. The new machine is available in three sizes with booms 75-, 85- or 100-ft. long and turntable diameters of either 14 or 20 ft.

The American "Revolver" is manufactured as a complete unit and offered as an addition to the company's standard line. Production of these machines will be carried on at both New York and St. Paul.

New Metallic Hinge Pins

NEW metallic hinge pins on the three smallest sizes of "Alligator" steel belt lacing are now being supplied by the Flexible Steel Lacing Co., Chicago. These have been developed to replace the rawhide pins previously used with this type of lacing.

The new pins will be furnished with these sizes of lacing, but the older type can be had if desired, the manufacturers state.



Vibrator dewatering conveyor for final cleaning of sized aggregates

News of All the Industry

Incorporations

International Lime Co., Seattle, Wash., $400,000.

General Quarry Co., Austin, Tex., $25,000. G. J. Dittmar, M. H. Goldstein and H. J. Wilson.

Constitution Stone Co. (Ohio corporation), incorporated in West Virginia.

Concrete Pipe Products Co., Inc., Lake Charles, La., $25,000. C. L. Briggs.

Allegany Sand and Gravel Co., Olean, N. Y., is reported as having filed certificate of dissolution.

Longmeadow Quarries, Albion, N. Y., 200 shares common. J. T. Wilson, Williamsville, N. Y.

Turner Gravel Co., San Antonio, Tex., decreasing capital stock from $150,000 to $130,000.

Rochester Sand and Cut Stone Corp., Rochester, N. Y., 250 shares.

United States Gypsum Co., Chicago, Ill., increased capital stock from $35,000,000 to $70,000,000.

Nailable Cinder Block Corp., Brooklyn, N. Y., 100 shares common.

Millmont Quarry Co., Reading, Penn., $250,000. Walter R. Hollinger, Irvin F. Weber and Jacob L. Miller.

Oriental Cement Co., Cleveland, Ohio, 200 shares no par value. A. P. Gustafson, 241 Euclid Ave., Cleveland.

Guadalupe Gravel Co., Seguin, Tex., 2500 shares no par value. Paul Schriewer, R. A. Jahns and A. J. Wirtz.

Haden Lime Co., Houston, Tex., 300,000 no-par-value shares and $300,000. W. D. Haden, W. A. Wansley and Mrs. Lucy Haden.

Lime Bluff Co., Harrisburg, Penn., $5,000. To operate quarry. Henry H. Wilson, L. T. Wilson and H. A. Reid, all of Harrisburg.

Arnold Asbestos Co., 6514 N. Clark St., Chicago, Ill., $20,000. D. C. Norberg, M. T. Reddy and A. W. McCarthy.

St. Albans Sand Co., St. Albans, W. Va., $10,000. F. H. Sattes, F. L. Sattes, Franz Sattes, L. P. Harvey and Elizabeth Harvey, all of St. Albans.

Waltham Lime and Cement Co., Waltham, Mass., $100,000; 1000 shares at $100 each. H. M. Derderian, president; Ara R. Derderian, 216 Newton St., Waltham, treasurer, and Irene Derderian.

Quarries

Consumers Co., Chicago, Ill., has increased the number of its directors from 15 to 19.

Rancho Rock Co., Van Nuys, Calif., has plans under way for a $7500 addition to its plant at 11500 Radford Ave.

Liberty Lime and Stone Co., Inc., Rocky Point, Va., is planning plant improvements, including installation of an electric shovel with 1½-yd. dipper capacity for quarry loading.

Mineral Wells Crushed Stone Co., Mineral Wells, Tex., at its annual meeting of stockholders elected the following officers: W. I. Smith, president; George P. Maury, vice-president, and George Ritchie, secretary-treasurer.

Florida Basic Rock Co., Marianna, Fla., was recently awarded a contract for 24,000 yd. of Florida lime rock to be delivered to Project No. 20 on Highway No. 1 between Caryville and Westville, Fla.

Indiana Limestone Co., Bedford, Ind., reports increased sales for January. The total for January was $942,438, which is an increase of $30,031 over that month a year ago and an increase of $49,522 over December, 1929.

Sand and Gravel

Great Northern Railway will construct a new gravel washing plant at New London, Minn., at a cost of $175,000.

Hill Sand and Gravel Co., New Westminster, B. C., has installed a new gasoline power shovel-derrick with a 75-ft. arm at its gravel pit on the North road.

Bowsman Gravel Co.'s Piqua, Ohio, plant was raided by thieves recently who broke into the company's offices during the night and took 50 gallons of gasoline and a quantity of motor oil.

Greenville Sand and Gravel Corp., Columbus, Ohio, suffered losses recently when fire of unknown origin broke out at the company's plant one-fourth mile south of the west end of Greenlawn Ave. viaduct. The gravel tipple was destroyed.

The McDougal Construction Co., Sioux City, Ia., has leased the sand pit owned by M. B. Musgrave, south of Woodbine, Ia., and will begin shipment of gravel from this point April 1. The material will be used on highway construction in the vicinity. A switch track is being built by the Northwestern road to the pit.

Mt. Vernon, Ind. The George J. Thomas gravel yard on the Ohio river at Mt. Vernon, Ind., is expected to be open soon. Considerable equipment, including a hoisting engine, clamshell dipper derrick and belt conveyor, has already been set up. Mr. Thomas has contracted with the Henderson Sand and Gravel Co. at Henderson, Ky., for gravel.

County Sand and Stone Corp., recently formed by a merger of the Yonkers Sand and Stone Co., Frank D. Cooney, Inc., and F. A. Ottman and Son, has elected the following officers: Louis J. Ottman, Mamaroneck, N. Y., president; Edward J. Murray and F. A. Ottman, Yonkers, N. Y., vice-presidents; James A. Martin, Yonkers, secretary, and Frank D. Cooney, Yonkers, treasurer. Directors are L. J. Ottman, James A. Martin, Frank D. Cooney and William F. McCabe of White Plains, N. Y. A fleet of 80 trucks will be operated by the new company, which will cover the territory between Yonkers and Albany on the Hudson, and from the New York City line to Stamford, Conn., on Long Island Sound.

Cement

Pennsylvania-Dixie Cement Corp., New York City, will resume operations at its Kingsport, Tenn., plant the first of March. The mill was closed down nearly a year ago. Between 150 and 200 men will be employed at Kingsport and between 50 and 75 men at the plant's rock quarry near Gate City, Va.

Volunteer Portland Cement Co., Knoxville, Tenn., was awarded contract for 200,000 bbl. of cement at an approximate price of $500,000 by the North Carolina Highway Commission. The cement is to be used in highway construction and deliveries are to be strung out over a period of more than a year.

Universal-Atlas Cement Co.'s executive offices, at present quartered with those of the parent company, United States Steel Corp., in the Continental National Bank Bldg., are to be transferred to the Adams-Franklin Bldg. at 222 West Adams St., under a five-year lease from March 1. The lease covers 5600 sq. ft. of space on the 12th floor of the Adams-Franklin Bldg.

Colorado Portland Cement Co.'s plant northwest of Fort Collins, Colo., which has been closed since October 28 of last year, due to shortage of natural gas supply, has resumed operations. Natural gas from the Amarillo, Tex., fields is being used to furnish heat and power at the plant. The plan of using coal to operate, as reported in ROCK PRODUCTS February 1, was abandoned. The plant will be operated at half capacity for a time until the demand necessitates running at full capacity.

Lime

Mt. Diablo Lime Marl Co., Concord, Calif., is reported as having filed petition for dissolution.

Warner Co., Philadelphia, Penn., announces the return of Earl Henderson to the engineering department as engineer of the company's lime plants after his temporary foremanship at the Knickerbocker plant. R. H. Williams has been made general foreman at Knickerbocker.

Black Marble and Lime Co., Enterprise, Ore., elected the following to the board of directors at its recent annual meeting of stockholders: J. A. Burleigh, C. A. Bingaman, M. Goldrick, S. D. Keltner, E. D. Peal, F. C. Gowing, G. K. McDonald, William Roulet and H. B. Davidhizer. Officers of the company are C. A. Bingaman, president; J. A. Burleigh, secretary; G. K. McDonald, vice-president, and H. McGoldrick, treasurer.

Cement Products

Stucco Products Co. of Florida is reported to be building a new $60,000 plant in West Jacksonville, Fla. Col. Carl M. Pihl is president of the company.

Carbon Concrete Brick Co., Youngstown, Ohio, subsidiary of the Carbon Limestone Co., reports that present orders are highest in history. F. O. Earnshaw was re-elected president of the company at the annual meeting.

Miscellaneous Rock Products

Planters' Fertilizer and Phosphate Co., Greenville, S. C., is considering rebuilding the part of its mill which was destroyed by fire on February 8.

Superior Bauxite Co., Bauxite, Ark., has been acquired by the American Cyanamid Co.'s subsidiary, Kalbfleisch Corp.

Texas Potash Corp., Dallas, Tex., will soon start producing potash on an extensive scale in the Midland, Tex., area, as a result of the discovery by E. P. Schoch, director of the Bureau of Industrial Chemistry, University of Texas, of a method for refining polyhalite ores.

Obituaries

Bernard J. Hausfeld of the Lunkenheimer Co., Cincinnati, Ohio, passed away on February 18.

Personals

Earl D. Stearns, formerly vice-president of the Fairfield Engineering Co., Marion, Ohio, is now western sales manager of the Robins Conveying Belt Co., New York City.

Darwin Meisnest has been appointed sales manager of the Pacific Coast Cement Co., Seattle, Wash., with headquarters in the company's general offices in the Smith Tower Bldg., Seattle, Wash.

H. N. Mathias and **V. F. Covert** have been elected assistant general auditors of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn.

E. L. Davis of the Cleveland office of Raymond Bros. Impact Pulverizer Co. advises that after March 1st his headquarters will be at the Chicago office of the company, 1319 North Branch St., Chicago, Ill.

Fred A. Daboll, for many years associated in important positions in Charles Warner Co., Philadelphia, Penn., has been appointed to fill a new position, that of director of publicity and personnel for both the Warner and American Lime and Stone companies.

Harvey W. Smith has resigned as general superintendent of the lime plants of the Warner Co. Mr. Smith joined the organization of the company in 1900. He rapidly worked his way upward and became superintendent of the Cedar Hollow plant. Later he was placed in charge of all the lime plants. **J. G. Wilson** succeeds Mr. Smith.

Scott Turner, director of the United States Bureau of Mines, Washington, D. C., has just been elected vice-president and director of the American Institute of Mining and Metallurgical Engineers. In addition he was recently elected chairman of the Washington (D. C.) section of the same organization.

John K. Watson of the Allegheny River Sand Corp., Kittanning, Penn., gave a very interesting talk on the sand and gravel industry as related to the Allegheny valley district, at the recent Kiwanis Club meeting at Kittanning. Mr. Watson made reference to the new development of his company on the east side of the Allegheny river at Mahoning, which was made necessary by the Interstate Commerce Commission ruling that where sand and gravel is shipped over two different railroads an additional charge of 20c per ton is made. It was thus necessary that the company get a location on the Pennsylvania railroad in addition to the original plant on the Pittsburgh and Shawmut railroad on the west side of the river.

Manufacturers

Chain Belt Co., Milwaukee, Wis., re-elected directors and officers at the recent annual stockholders' meeting of the company.

Electric Machinery Manufacturing Co., Minneapolis, Minn., announces that the new location of its Detroit office is at 10-230 General Motors Bldg.

The Reeves Brothers Co., Alliance, Ohio, has changed its name to the A. G. Reeves Steel Con-

struction Co. No change in corporate structure or organization is involved.

Sullivan Machinery Co., Chicago, Ill., at its annual meeting of stockholders elected Preston Upham and Charles F. Weed as directors to succeed George B. Upham and Edwin A. Potter, Jr.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., is planning a subsidiary, the Westinghouse Electric Co. of South Africa, Ltd., with capitalization of 50,000 shares.

Morris Machine Works, Baldwinsville, N. Y., announces that its Chicago office is now located at Room 716, Builders Bldg., 228 North La Salle St., Chicago, Ill. The office will be in charge of F. S. Salchenberger.

Goodall Rubber Co., Philadelphia, Penn., announces the opening of a branch office at 1431 West Ninth St., Cleveland, Ohio, under the management of T. S. Stewart, who has for several years been associated with the mechanical rubber business of the company in Cleveland.

The Byers Machine Co., Ravenna, Ohio, has appointed Edward R. Bacon Co. of San Francisco, Calif., as its sales representative in San Francisco and northern California. The Bacon company will handle the entire Byers line, as well as replacement parts.

Easton Car and Construction Co., Easton, Penn., on February 24 moved its New York office from 50 Church St. to 10 East 40th St., New York City. The company has appointed A. H. Cox and Co., Inc., 1757 First Ave., South, Seattle, Wash., as its exclusive agent for the state of Washington.

The Yale and Towne Manufacturing Co., Stamford, Conn., has opened a Syracuse, N. Y., sales office at Room 534 Gurney Bldg., telephone number 2-3062, for the New York state area. H. R. Bungay, Jr., will be in charge of this office and will be assisted by George Sherrill.

B. F. Goodrich Rubber Co. merger with the Miller Rubber Co. has been approved by the stockholders. Under terms of the merger Goodrich assumes all the assets and liabilities of Miller Rubber in exchange for 113,504 shares of B. F. Goodrich common stock.

Hercules Motors Corp., Canton, Ohio, will exhibit its line of engines and power units at the Oil Equipment and Engineering Exposition to be held in Los Angeles, March 16-23. The company exhibit, in space 330, will be in charge of George W. Belden, West Coast representative.

Bucyrus-Erie Co., South Milwaukee, Wis., has received an order from the Anglo-Chilean Nitrate Co. for 24 large revolving shovels, involving more than $1,250,000. The shovels will be used for mining nitrate in northern Chile. This represents the largest single order the company has received in several years.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has opened new branch offices at Bloomington, Ill., and Omaha, Neb. The company has appointed the Motor Power Equipment Co. as distributor of its wheel tractors in territory embracing Minnesota, North Dakota, South Dakota, Montana, Wyoming and western Wisconsin.

McGann Manufacturing Co., Inc., York, Penn., who has the sole rights on this continent for the patented McGann-Sobek lime kiln, announces that Mr. Oscar Sobek of Vienna, Austria, has arrived in the United States and is now associated with the company in the capacity of consulting engineer to assist in the erection and operation of Sobek kilns.

Cutler-Hammer, Inc., Milwaukee, Wis., has appointed Frank J. Burd as manager of its Philadelphia office to replace T. E. Beddoe, who resigned. Mr. Burd is a specialist in motor control engineering. He has been with the company continuously for the past thirty years with the exception of two years when he was electrical engineer for the Midvale Steel and Ordinance Co., Johnstown, Penn.

E. I. du Pont de Nemours and Co., Wilmington, Del., announces that the eastern laboratory has recently developed two new low density gelatin explosives which will be marketed under the name of Gelex No. 1 and Gelex No. 2. These new products are intended for use in underground mining of limestone and other nonmetallic minerals. Both explosives are extremely cohesive and plastic so that they will load well in upward-pointing holes.

Hercules Powder Co., Wilmington, Del., announces that road work on the grounds of the new experimental station site is practically completed, and excavation is now starting for the foundation work of the new main laboratory building. A number of other buildings, including several semi-plant units, will be erected prior to the removal here of most of the company's research facilities from Kenvil, N. J. A new freight forwarding and receiving station named Hercules, Del., on the Landenburg branch of the B. & O. railroad, has a special side-track to the new experimental station.

Chicago Pneumatic Tool Co., New York City, has opened a branch office at 327 Philcade Bldg., Tulsa, Okla. George J. Lynch has been appointed district manager in charge of this office and the territory it serves. The branch office will handle all details of the sale and servicing of compressors, engines, pneumatic tools, electric tools, vacuum pumps, condensers and rock drills. The office and service station at 1 West 16th St., Oklahoma City, Okla., recently opened for exclusive handling of the CP Tucone Rock Bit, will continue in the same capacity.

Trackson Co., Milwaukee, Wis., has appointed the following new distributors to handle Trackson Tractor equipment for McCormick-Deering tractors: J. D. Adams Co., Indianapolis, Ind., who will cover the territory included in the Indianapolis, Fort Wayne, Richmond, Terre Haute and Evansville, Ind., branches of the International Harvester Co., and also that of the Louisville, Ky., branch; McCarthy-Jones and Allen Co., Inc., Nashville, Tenn., who will cover the Nashville territory, and the Option Equipment and Supply Co., R. F. D. No. 6, Mt. Oliver Station, Pittsburgh, Penn., for the Pittsburgh territory.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Locomotives. Two new bulletins covering Whitcomb gasoline and oil-electric switching locomotives, in sizes from 15 to 100 tons; 4- and 8-wheel types. GEORGE D. WHITCOMB CO., Rochelle, Ill.

Refractories. Attractive booklet giving service records of 22 Arcofrax hot zone linings in the kilns of a prominent cement company. GENERAL REFRACTORIES CO., Philadelphia, Penn.

Concrete Mixers. Bulletin **No. 306** illustrating and describing the Rex MixHaul, a self-contained unit for the efficient mixing of concrete en route to the job, in 2-, 3- and 4-yd. sizes to fit any make truck. CHAIN BELT CO., Milwaukee, Wis.

Electric Arc-Welding Equipment. Bulletin outlining advantages of the new improved "Stable-Arc" welders in types and sizes for every welding purpose. THE LINCOLN ELECTRIC CO., Cleveland, Ohio.

Portland Cement. The use of "Incor" Perfected High-Early-Strength portland cement where time is an important factor is comprehensively covered in a new folder issued by the INTERNATIONAL CEMENT CORP., New York City.

Trap Rock. Testimony as to the durability of trap rock is presented in a new broadside showing an ancient memorial of trap rock recently uncovered in a remarkable state of preservation. THE JOHN T. DYER QUARRY CO., Norristown, Penn.

Conveyor Belting. Folder on "Indestructible" heavy-duty conveyor belting for use wherever large quantities of loose bulk materials are handled. NEW YORK BELTING AND PACKING CO., New York City.

Screens. Bulletin outlining the notable features of single and double deck Gyrex screens for crushed stone and sand and gravel plants, available in three models, providing several combinations of size, speed and action. ROBINS CONVEYING BELT CO., New York City.

Cutting Waste. A very comprehensive and informative chart showing 64 points where interest and co-operation of personnel can help cut down unnecessary waste in operation. Of interest to every business executive. THE ELLIOTT SERVICE CO., New York City.

Power Shovels. Catalog **R-3**, a 16-page book describing the Model R, a ¾-yd. heavy-duty, full-revolving, convertible power shovel, manufactured to operate shovel, clamshell, trench hoe, skimmer, dragline or crane booms. BAY CITY SHOVELS, INC., Bay City, Mich.

Crushing, Grinding, Pulverizing and Drying Machinery. Bulletin **No. 10**, giving latest and complete listing of good, used crushing, grinding, pulverizing and drying machinery of various makes, available for purchase. CONSOLIDATED PRODUCTS CO., INC., 17 Park Row, New York City.

Nickel Alloy Steel Products. Buyers' Guide of January 1, 1930, on nickel alloy steel products, giving items most frequently asked for, with the names and addresses of companies manufacturing each particular item. INTERNATIONAL NICKEL CO., INC., New York City.

Pyrometers. The dependability, economy and other advantages of the Republic control pyrometer, which is sensitive to a temperature change equal to one-tenth of 1% of the full scale reading, are outlined in a new broadside of the REPUBLIC FLOW METERS CO., Chicago, Ill.

Dust and Fume Recovery. Bulletin **No. 105**, listing Dracco dust and fume recovering installations and showing the materials recovered. Bulletin No. 17, describing a notable Dracco fume recovery installation. THE DUST RECOVERING AND CONVEYING CO., Cleveland, Ohio.

Facing for Steel. Bulletin on Blackor, abrasion-resistant facing for steel, applied direct to the tool's cutting area by the carbon electric arc. Booklet gives full instruction data for application of Blackor to various tools. BLACKOR CO., Los Angeles, Calif.

Ground Pressure Data. Booklet dealing with the value of low ground pressure to the contractor and correcting some old theories on how the ground pressure of crawler shovels, cranes and draglines should be figured. NORTHWEST ENGINEERING CO., Chicago, Ill.

Compressors and Hoists. Compressors in two sizes having piston displacement of 120 and 240 cu. ft. per minute, and various types of standard hoists from 8 to 150 hp. are covered in a new broadside issued by the O. K. CLUTCH AND Machinery Co., Columbia, Penn.

Wire Rope Clips. No. 7, Volume 8, of "The Crosby Clipper," the little magazine of the American Hoist and Derrick Co., has a number of interesting articles on the elimination of accidents due to wire rope fastenings. AMERICAN HOIST AND DERRICK CO., St. Paul, Minn.

Electrical Engineering. "Engineering Achievements in 1929" is the title of a very interesting and comprehensive publication, designated as **No. 1717-D**, outlining Westinghouse developments in 1929. WESTINGHOUSE ELECTRIC AND MFG. CO., East Pittsburgh, Penn.

Industrial Power-Factor Problems. "Industrial Power-Factor Problems Solved by Scale," as the title implies, is an interesting folder showing how these problems can be solved by scale without resorting to degrees or functions of angles, squares or square roots. GENERAL ELECTRIC CO., Schenectady, N. Y.

Quarry Cars and Track. Bulletin **No. 62**, illustrating and describing representative group of quarry cars, such as air-dump cars, end-dump cars of the lift-door type and rocker type, flat cars, one-side-dump cars, pan type cars, platform cars, etc.; and track and track equipment of various types. KOPPEL INDUSTRIAL CAR AND EQUIPMENT CO., Koppel, Penn.

Refractories. A full line of refractories, including Laclede fire brick, Suprafrax brick and shapes, a highly aluminous super-refractory, and an excellent liner for cement kilns, various kinds of bond clays and furnace clays, furnace tiles, gas producer linings and arches, lime kiln linings, refractories for the iron and steel industry, vitrified clay products, refractory mixtures, etc., are covered in a new broadside of the LACLEDE-CHRISTY CLAY PRODUCTS CO., St. Louis, Mo.

Commercial Pallets. Commercial pallets for the concrete products industry are covered in a new bulletin just issued. Pressed steel pallets, standardized stripper block pallets, stripper tile pallets, face-down block pallets, standardized pallets for Besser stripper or face-down block machines, self-racking pallets, the commercial rolled corner brick pallets, and various types of special pallets are described, with full details and specifications. COMMERCIAL SHEARING AND STAMPING CO., Youngstown, Ohio.

G-E Bulletins. GEA-19F covering CR7006-D5 and D7 a.-c. enclosed magnetic switches for alternating current motors; **GEA-1231** on quiet-operating induction motors; **GEA-1232**, a 25-page book on electric equipment for handling heavy material; **GEA-402A**, a very attractive booklet on motion pictures and illustrated lectures showing the development, manufacture and application of electric products. The films listed in the booklet are lent without charge to those interested. **GEA-1158A** gives a chart to determine the cost of operating electric appliances and motors, with instruction for its use. GENERAL ELECTRIC CO., Schenectady, N. Y.

Hand Book on Refractories

THE HARBISON-WALKER REFRACTORIES CO., of Pittsburgh, Penn., is the world's largest producer of refractories, with operations in Pennsylvania, Ohio, Kentucky, Indiana, Missouri, Alabama, Georgia and Wisconsin. Its plants have a yearly capacity equivalent to 450,000,000 standard 9-in. fire brick per year.

The company recently published a book entitled "Modern Refractory Practice" that is a credit to its authors and sponsors. The book is in reality a handbook on the manufacture, design and use of refractory materials. The text contains a world of valuable information for users of fire brick and accessory materials. There are given a number of useful tables and formulas for calculating brickwork.